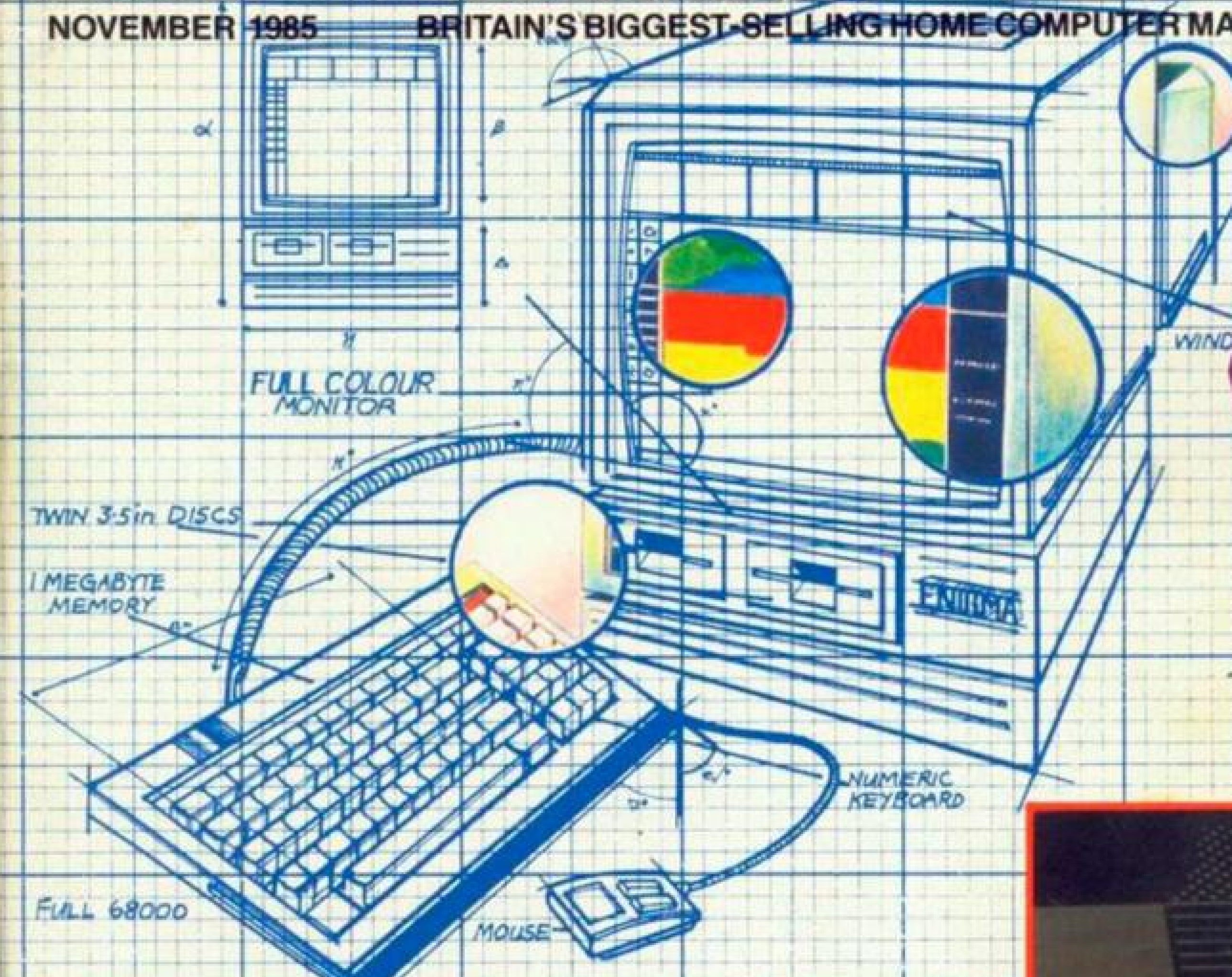
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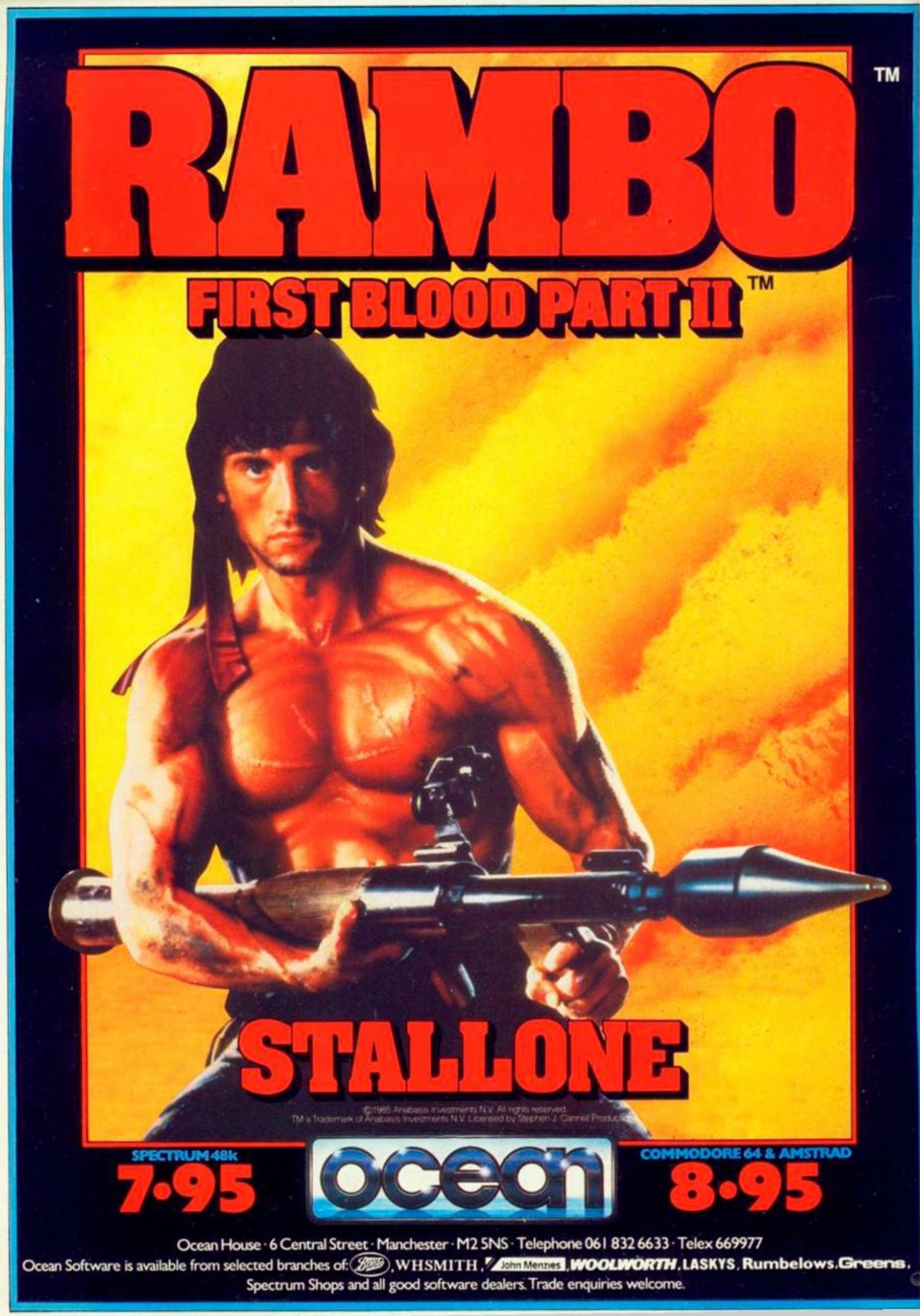
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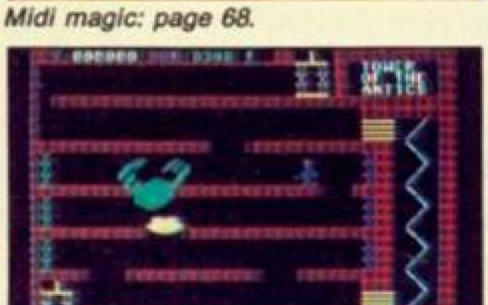
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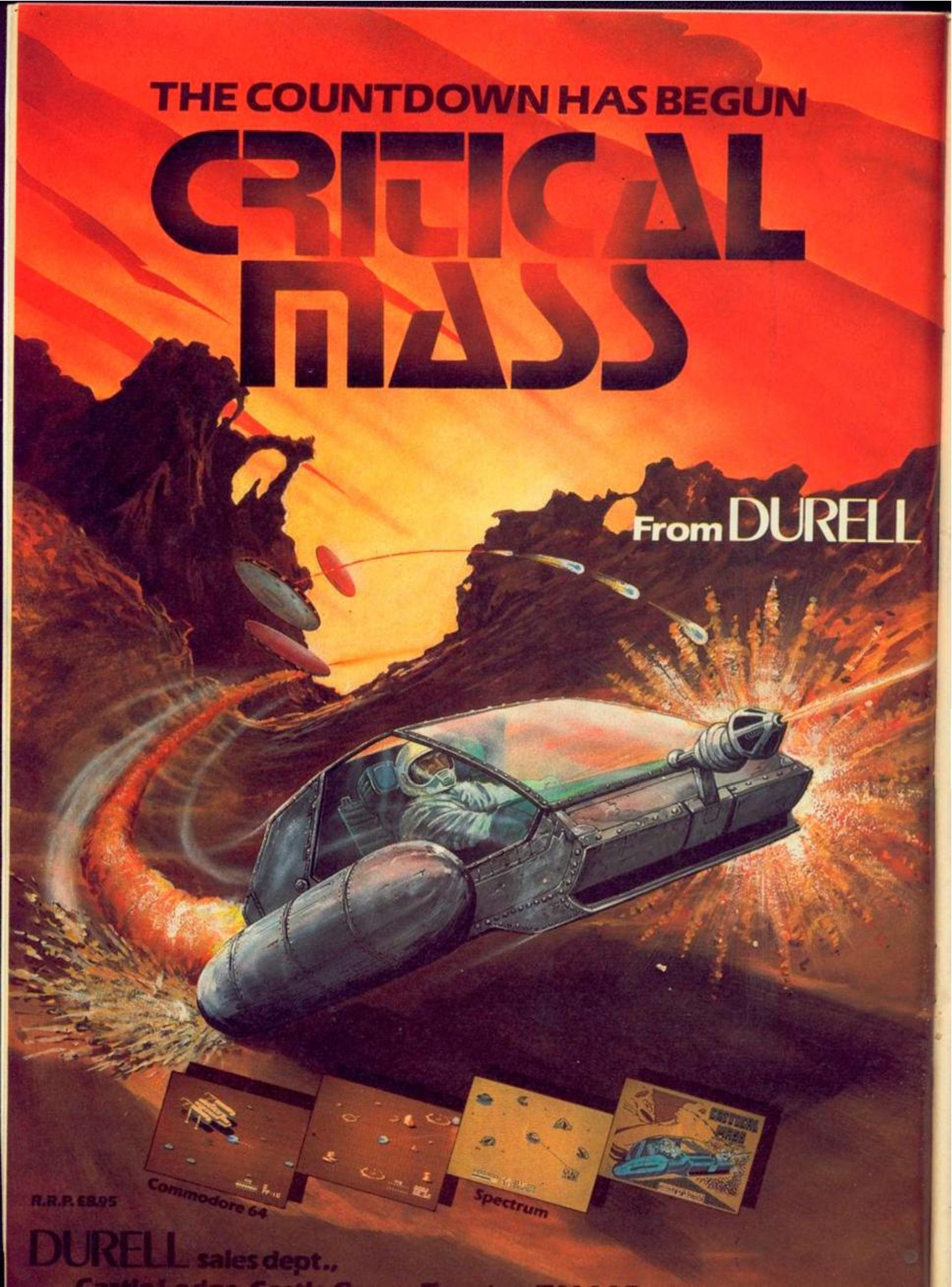
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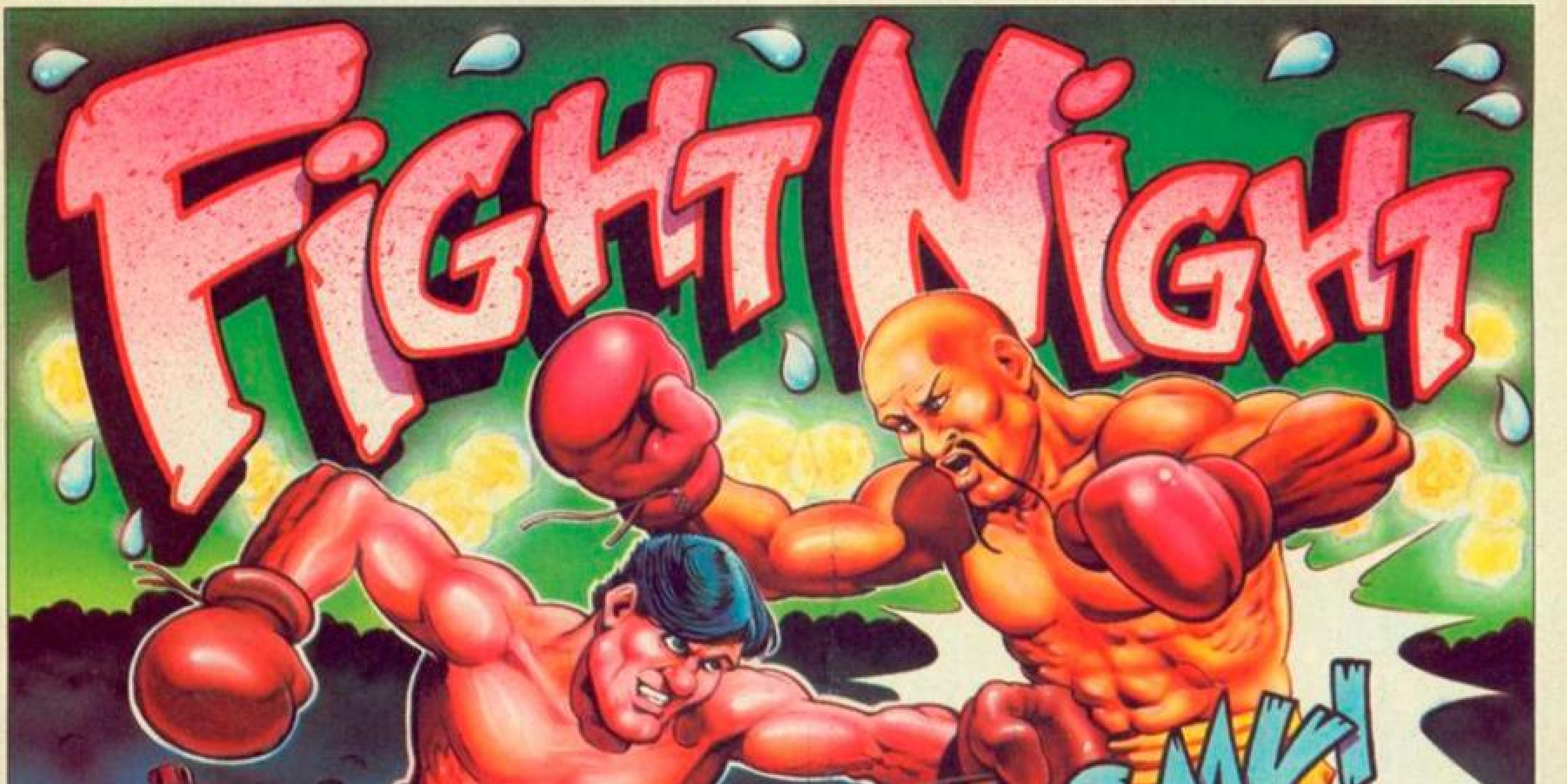
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BY MERVYN ESTCOURT

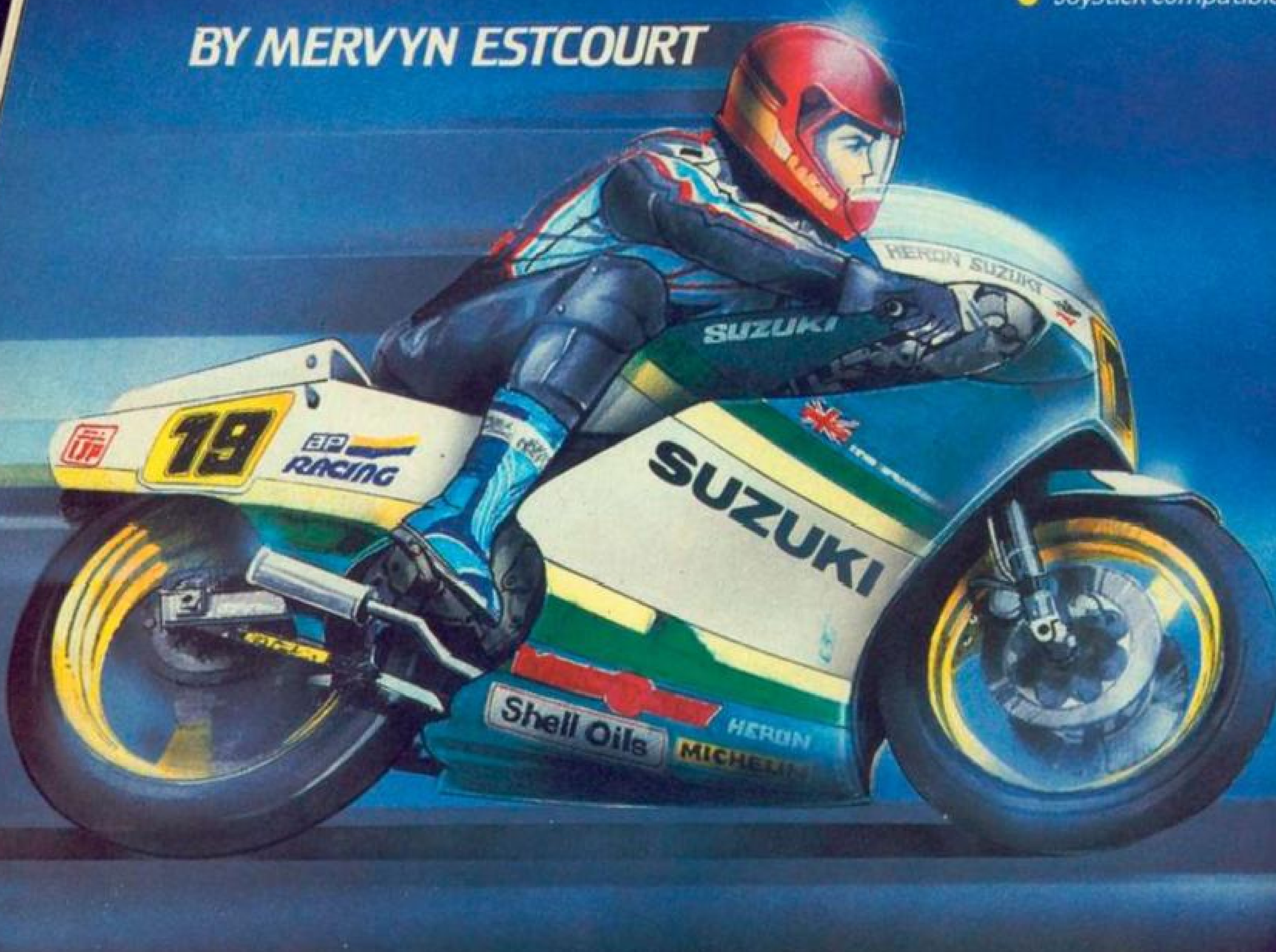


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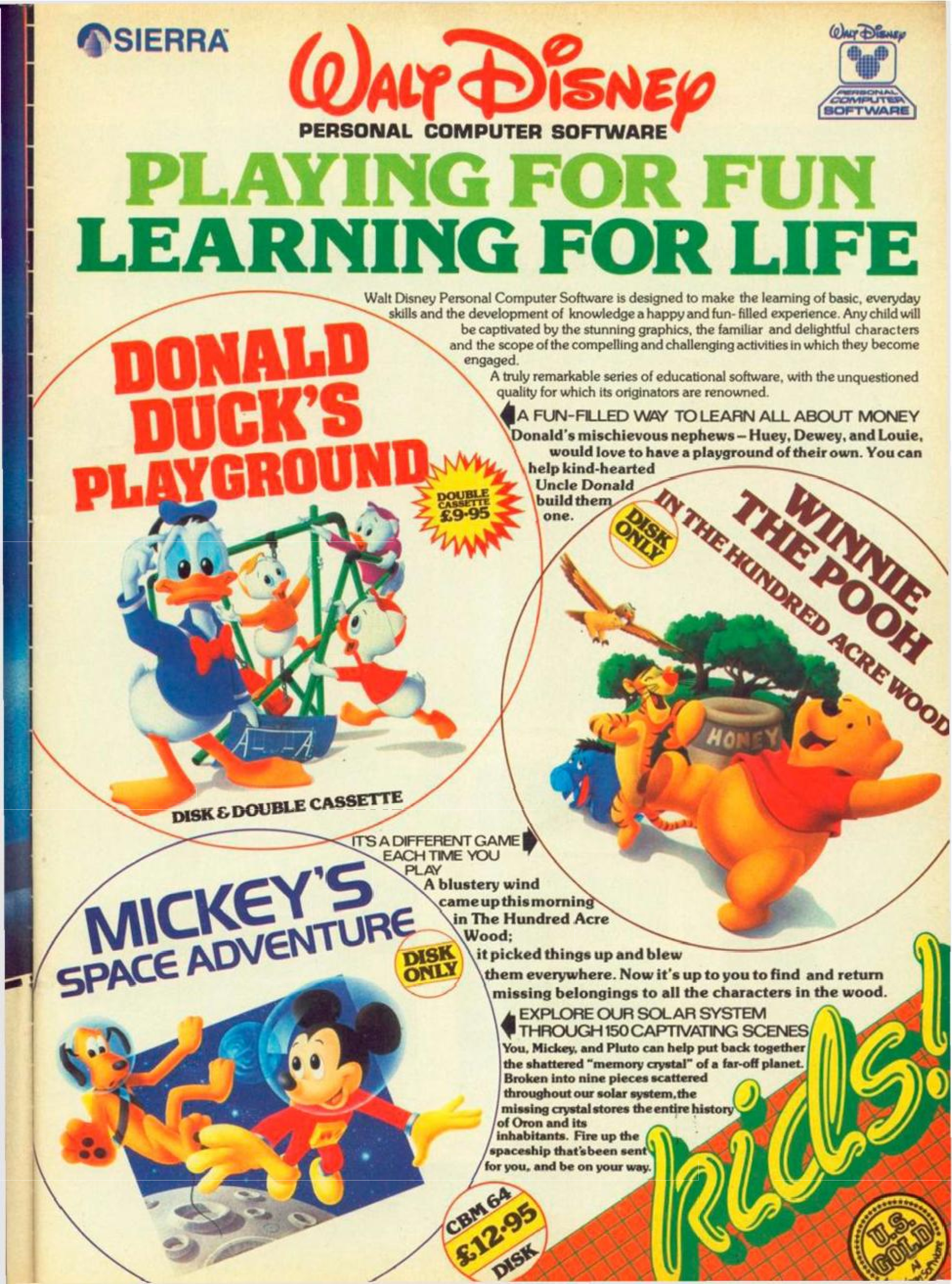
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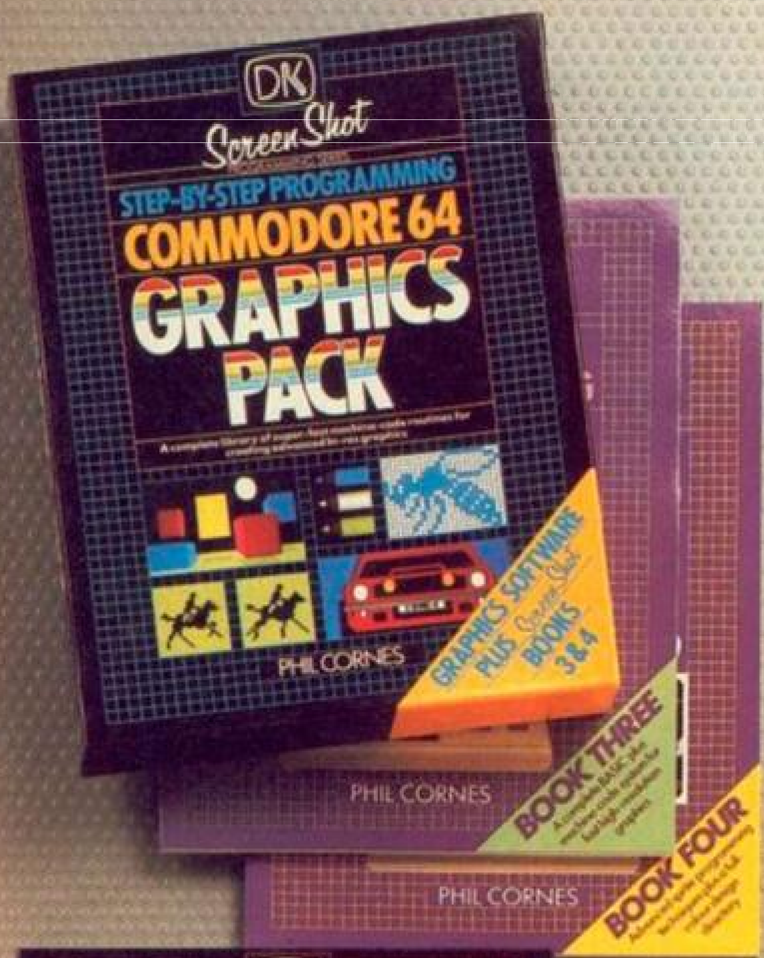
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PACKS



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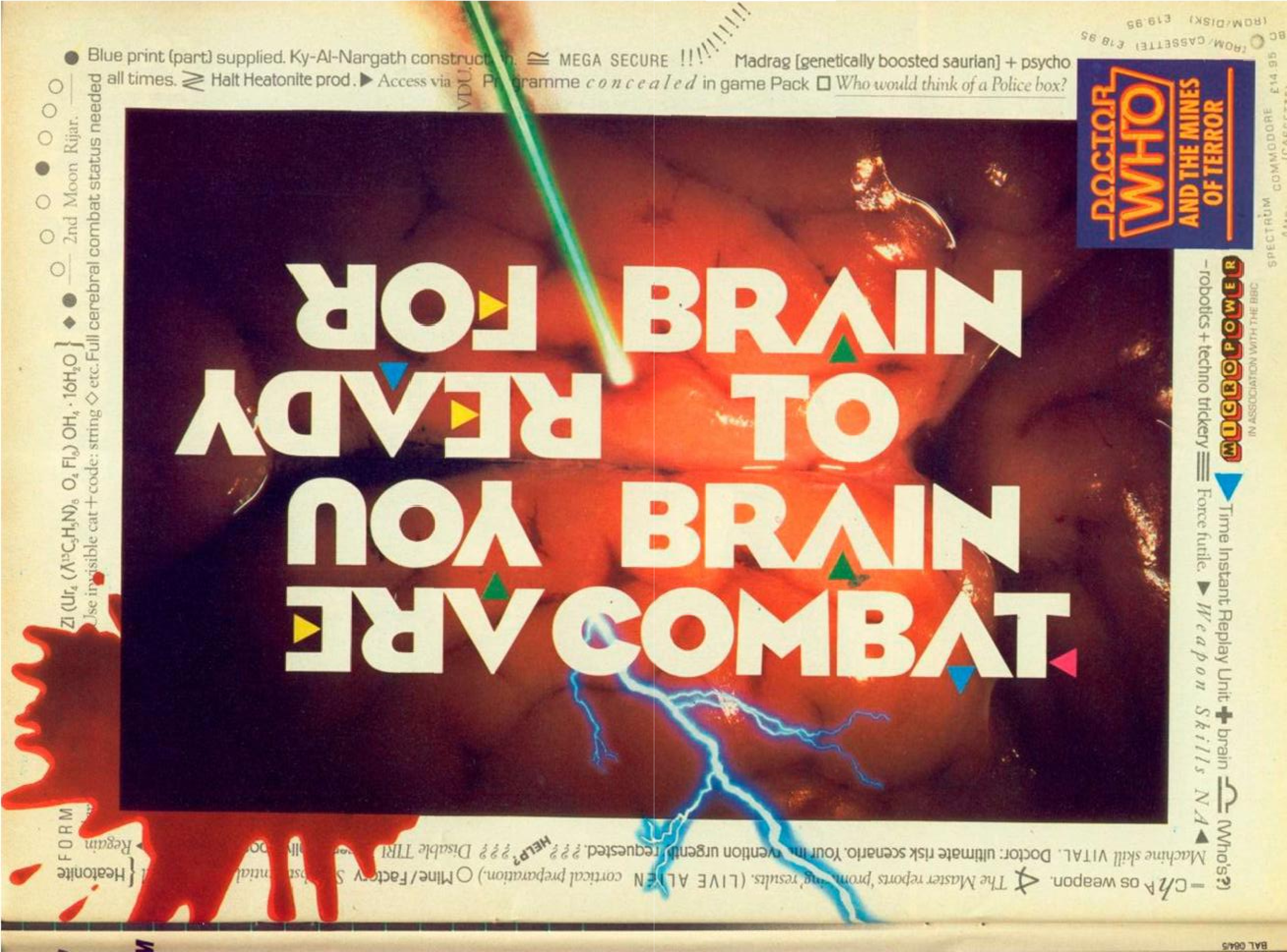
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THE LAMPS ARE GOING OUT...

THE PULL OF profit and prestige sucked Britain's biggest computer manufacturers Sinclair and Acorn into their great American disasters. If only they had looked closer to home. There, right on their dorrsteps waited the huge and largely untapped European markets.

At least Sinclair and Amstrad seem now to have cottoned on. Amstrad's impressive £20 million profit figures owe much to very healthy overseas sales — it's pushing its computers hard in West Germany under the Scheider marque, chosen to appeal to the Teutonic sensibility. Ironically the name Amstrad in this country scores with its overtones of Scandinavian efficiency.

Sinclair on the other hand has gone Spanish. Granting Investronica of Madrid the right to build a 128K machine may prove to be one of the most intelligent moves the company has made since the launch of the Spectrum itself back in 1982. Spain may not be in the same league as the U.K. in terms of computers per capita, but then that's the perfect reason for going there. Potentially it also opens up the vast Spanish-speaking South American market.

The Spaniards have already proved their skills in the car-building business: they took on contracts from major automotive manufacturers to build cars under licence. Now they are among the biggest car builders in Europe and are selling their own models into other countries.

Even British products written off as failures in the U.K. have been eagerly scooped up by other Europeans. Now alongside the Camembert factories you'll find Orics being churned out in Normandy, or Dragons being bred in Spain by Eurohard.

Two years ago Britain was a long way ahead in terms of volume and sheer variety of computers. If more energy had been spent then in spreading the risks and making a mark in Europe and less on the notoriously volatile U.K. scene, many of the financial disasters of 1985 could have been avoided.

The sun may never set over the British computer Empire, but that's because it never rose in the first place. If companies are to survive it must be on a broader footing. Europe may be the last chance they get.

Editor: TOBY WOLFE; **Assistant Editor:** MEIRION JONES; **Production Editor:** IAN VALLELY; **Software Editor:** SIMON BEESLEY; **Commercial Software Editor:** PAUL BOND; **Editorial Assistant:** LEE PADDON; **Editorial Secretary:** LYNN DAWSON. Editorial 01-661 3144. **Advertisement Manager:** NICK RATNIEKS 01-661 3127; **Assistant Advertisement Manager:** KEN WALFORD 01-661 8548; **Advertisement Executive:** KAY FILBIN 01-661 8484; **Northern Office:** CHRIS SHAW 061 872 8861; **Advertisement Secretary:** MAXINE GILL; **Classified:** SUSAN PLATTS 01-661 3036; **Publisher:** GAVIN HOWE. Your Computer, Room L221, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. ©Business Press International Ltd 1985. Printed in Great Britain for the proprietors Business Press International Ltd, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Tel: 01-661 3500, Telex/grams: 892084 BIPRESG ISSN 0263-0085. Printed by Riverside Press Ltd, Whitstable, Kent, and typeset by Instep Ltd, London EC1. Subscriptions: U.K. £14 for 12 issues. ABC 131,769 July-December, 1984.



"Take that. Fion the Magic Cirle."

BATTLE OF WIZARDS

BRITAIN'S WIZARDS are locked in battle over who shall control the market for micro magic. One man, David Hambly from Knights Way (yes seriously) Ilford is taking on the whole power of the Magic Circle. The Magic Circle is releasing a book and tape which will allow you to perform 15 different tricks on your Spectrum, Commodore or Amstrad. "When you learn from this book and software the secrets of magic, remember that you must keep them to yourself." says John Salisse, Secretary of the Circle "They are not yours to give away". But despite John's claims that the Circle suite is unique David Hambly can show micro magin books and software that he has produced over the years. Contact Sardi's Software (01) 551-5908 for details.

Future plot

FLAT BED plotters are no longer the play things of the idle rich.

Future Music is selling Roland DXY100 A3 sized plotters at the remarkable price of £259. The plotter is connected to the computer via the centronics port, so, theoretically could be used with most home micros. However, the company only supplies software for the BBC. Supplied with the plotter is a ROM as well as some examples of 3D plots on cassette. The ROM routines include music and graph plotting, arcs and hatching. Resolution is to .1mm with a plotting speed of 70mm/s. You can find out further details from Future Music on (0245) 352490.

AMSTRAD BOOM

664 problems solved

AMSTRAD CONTINUES to confound the prophets of doom in the micro industry by announcing record turnover and profits up to £20 million compared to Commodore's announcement that it is losing $1 million a day and Acorn and Sinclair's dismal results. What is more Amstrad's boom is based almost entirely on computer sales. When the British market started to flag Amstrad just sold them abroad instead.

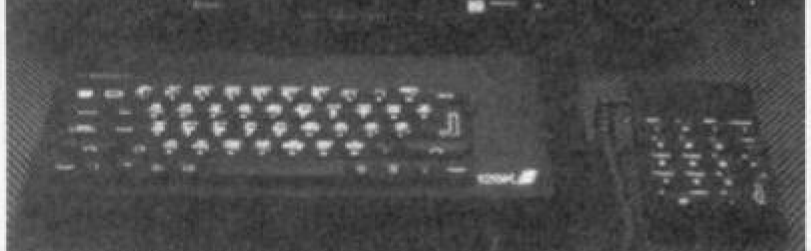
The PCW 8256 all-in-one word processing package is selling briskly. Unfortunately companies like Dixons had neglected to stock up with the 3 inch discs it uses, leading to shortages in many areas.



PCW 8256 sells too fast for Dixons.

Another problem for Amstrad 664 owners who found themselves ditched by the rapid introduction of the 6128 has been solved by DK'tronics. DK will sell an £50 64K extra memory unit for the 664 which will work with switching and system calls but not from Basic since the 664 Rom has not been overlaid. DK will also introduce a 256K expansion pack for £100 — the same price as a 16K expansion for the ZX-81 four software which uses bank years ago. A 256K silicon disc is also on the way.

SECRET DIARY OF SIR CLIVE, AGED 45¼



No grey 128s here, please.

SINCLAIR SAYS Spectrum Plus and QL sales are booming — selling at twice the rate of Commodore and Acorn put together.

But Commodore is now fighting back hard with an Adrian Mole promotion for the 64, delivery at long last, of the 128 and announcement of the Amiga's official launch in January.

Behind the scenes neither company is having an easy time with Commodore announcing $124 million losses for March, April and May while Sinclair is moving out of its prestige headquarters in Willis Road, Cambridge, sacking 20 of its 120 employees and losing the likes of Robb Wilmot and Nigel Searle.

Rumours that the Spanish Investronica-built Spectrum 128 would be unofficially imported to Britain have been quashed. The only "grey imports" will be to software houses preparing products for the British launch next February. Commodore's Christmas promotion meanwhile will bundle a 64, cassette recorder, Music Maker, Designer's Pencil and the book and game of The Secret Diary of Adrian Mole.

The Commodore 128 is now on sale as a standalone but because the cost of the original 128 including 1571 double-sided drive looked prohibitive it will now be bundled with the 1570 single-sided 0.5 Mbyte drive for $450.

DIARY

WHICH COMPUTER is "the BMW of the home computer business" and who called it that?

HERE'S A CLUE for the BMW question. the designer of one of the chips inside it "Dave" also designed the three-wheeler which won the Euromouse 1985 micromouse merge race in Brussels last month.

SMELLYVISION will hit your screens on October 20.Brother, the computer printer makers, are launching a scratch and sniff TV promotions for their high speed cookers. The idea is that you will pick up copies of TV Times impregnated with the smell of roast beef, pies and bread. If you live in the Granada or TVS areas and see a Borther commercial starting the idear is that you will race to your paper rack and then wait for a "scratch now" caption to appear as the oven door is opened. That could be fun with computer games, we could have scratch 'n sniff pads in *Your Computer*. A prize for the best suggestion.

BRITISH TELECOM is enjoying what it is learning from the home computer market. The little birds, which we diarists use in preference to those nasty leaky phones, tell us that Firebird tasted so nice that BT is buying Beyond as well.

STEVE JOBS, who gets the credit as co-founder of Apple with Steve Wozniak for starting the home computer revolution, has left the company on acrimonious terms. Apple is suing Jobs for stealing information and employees now that he has left to set up a company making educational computers.

MEANWHILE that once-mighty school micro maker Acorn has turned out to be a participant in the "Euro-rival to MSX" project. Olivetti is of course involved but the third participant is not Philips as expected, but Thomson which dominates educational computing in France.

BMW Enterprise of course. Who said it? Enterprise's Mike Shirley. Dave Woodfield, who designed the chips and the mouse works for Intelligent Software.

Elsie Dee

UPDATE

Better late than never, but sometimes it's difficult to tell the difference. Digital Integration, who rocketed to obscurity after over-night success, look like finally releasing *Tomahawk*, a helicopter simulator after keeping the punters wating for over a year.

Despite this, they might be forgiven if it turns out to be as wonderful as they say it is. Air combat, vector graphics, ground targets, lots of instruments, it may well have the same impact as Fighter Pilot did when it came out in what silicon archaeologists like to call the early durasic period.

Novagen still insists

Mercenery is on the way, leaving the answer phone to cope with the calls of anxious punters. Novagen assures us the delay is simply due to wanting to make it even better!

Spectrum Elite nears completion. Unfortunately, Firebird have had to leave out most of the missions that other, less scrupulous magazines reported were in their "review copy" due to memory restraints. However, it still promises to be wonderful. Apparently Firebird's Gyron team has virtually re written the structure so that it won't slow down when a lot is happening. A new launch sequence and revamped display is promised.

Activision has forsaken the humdrum world of the shoot-em-up, for the philanthropic pursuits. Apparently, they discovered the presence of **Little Computer People**, and unlike you or I, would simply have given the thing a voilent shake and hoped the little debugger would fall out, Activision, gave it a house, coaxed him out of the innards and on to the screen. Of course, they are all different, Activision just give you the house, and the little chap takes on his own individual character. Not only that, **Hacker** is an attempt to spare NASA's blushes, and many parent's phone bills by diverting code breakers from the real thing to a game with the highly laudable task of saving the world.

ARIOLLAMA

Minter joins Zombies

MINTER IS back with a vengeance — the label may have changed but the psychotropic dreamer maintains his firm commitment to fast-scrolling all-action shoot-'em-ups that leave the player with much deeper comprehension of the traumas of shell-shock. Batalyx — not so much released as allowed to escape — from Ariolasoft is obviously Jeff's compilation album, sitting well on his shelves next to the Pink Floyd Relics cassette, no doubt.

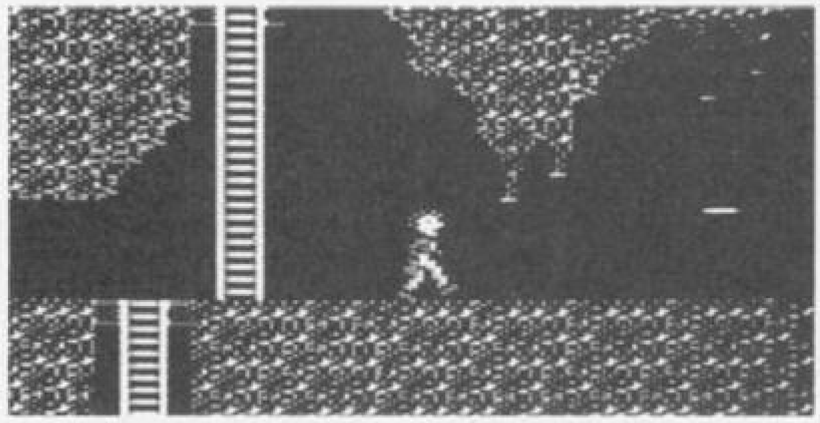
Six games for £12.95 on Commodore 64 disc, £9.95 on cassette: kick off with Hallucin-O-Bomblets, a freaky asteroid derivative; then AMC II, a dub version of Attack of the Mutant Camels; next, the very abstract Activation of Iridis Base. This gives you a driver's-eye-view of a mutant camel approaching a pyramid. When the base is activated a — you guessed it — Dark Side Of The Moon album cover effect is generated. The Ancipital returns in Cippy on the Run, followed by a geometric puzzle called Syncro II. Finally a re-run of Psychedelia. Review next month.



Recognisable Jeff Minter.

Scarabeus sees Ariolasoft's phalanx of Hungarian programmers producing good graphics, great sound and an absorbing arcade adventure. Aim of the game: find the fabulous Emerald jewel of the Pharaohs by zooming aroud a 3D maze in Scrollerama. On each of the three levels you must assemble or find a key to get to the next level by capturing ghosts or entering places of information. Zombies and spiders conspire to prevent you getting into the Pharaoh's tomb. This ranks with Ariolasoft's Skyfox as an attempt to market good original material, rather than the older US games. Wizard, the third release, includes a screen construction set, so if you get tired of jumping the climbing through 40 dazzling screens as you reach for diamonds, gold and pearls, you can change the game. Both Wizard and Scarabeus are £12.95 on C-64 disc, and £9.95 cassette.

DOCTOR WHO AND THE MICRO ROMS



"The Daleks are off but can I recommend the TARDIS".

ROM chips have got cheaper — some EPROMs are reportedly available for a quarter of their January price — which has literally created ROM to move for claustrophobic programmers sweating away trying to produce epics in 32 or 48K of memory. At least two software houses are using sideways ROMs to expand the memory of a specific computer so it can run a specific games program. Means you have to dig a little deeper into the piggy-bank, but they claim it's worth your while. At £14.95, Mikro-Plus (alias Mikro-Gen) are confident that Shadow of the Unicorn is value for money. Not only do you get 64K of program on you Spectrum and a 120-page illustrated book, but you also get a built-in joystick port, and back-up to microdrive or tape facility, plus a diagnostic checking and tape alignment routine for trouble-free loading.

Shadow of the Unicorn is the tale of an unwitting farmer who opening an old tomb he has discovered releases evil forces. There are 10 fully-animated characters all with their own part to play in helping you to reseal the book. There are 2,800 locations and 11,500 views according to Mikro-Gen's Tony Bentley. "It's a very deep and complex adventure — it will definitely appeal to people who like Valhalla or Lords of Midnight."

Dr Who and the Mines of Terror is Micro-Power's foray into the land of the sideways ROM. For your £18.95, you get another 16K of memory (19.95 for disc version) and very large platform game. The aim of the game is to recapture the plans of the TARDIS time machine and destroy the Master's factory. Based on the popular sci-fi TV series, it lacks Daleks, but has plenty of problem-solving.

Mikro-Gen see a future for ROM: two more expanded games are under development. Battle of the Planets, licensed from BBC TV, and the ultimate Wally game, Wally in Paradise.

THOUGHTS & CROSSES

37 MARKET STREET, HECKMONDWIKE, WEST YORKS

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ZX Spectrum 48K (+ £50 FREE software)	£89
ZX Spectrum Plus 48K (+ £50 FREE software)	£129
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Brother 1009 (Centronics)	£189
Juki 6100 (Centronics Daisy Wheel)	£369
Juki 2200 (Typewriter/Daisywheel Printer Centronics)	£275
Juki 6100 Sheet Feeder	£220
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Shinwa CP480 (RS232)	£238
Mannesman Tally MT80 Plus (Centronics)	£199
Shinwa CP80 (Centronics)	£195
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Alphacom 32 (Spectrum)	£69
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Juki 5510	£299
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Microline (Gray 80)	£2.35
MPS801	£8.50
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Canon/Kaga Taxan	£8
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POP★ TOPS

TOP 20

1	The Way of the Exploding Fist	Melbourne House	Sp/64/Am
2	Frank Brunos Boxing	Elite	Sp/64/Am
3	Nightshade	Ultimate	Sp
4	Hypersports	Imagine	Sp/64
5	Barry McGuigans Boxing	Activision	64
6	Hyway Encounter	Vortex	Sp
7	Summer Games II	US Gold	64
8	Frankie goes to Hollywood	Ocean	Sp/64
9	Sky Fox	Ariolasoft	64
10	Arnhem	CCS	Sp/AM
11	Thats the Spirit	The Edge	Sp
12	Death Star	Superior	E1/Bc
13	Impossible Mission	US Gold	64
14	Southern Belle	Hewson	Sp
15	Cylu	Firebird	Sp/64
16	Chopper	Sparklers	64
17	Nodes of Yesod	Odin	Sp/64
18	Booty	Firebird	Sp/64
19	Desert Burner	Sparklers	Sp
20	The Red Arrows	Database Software	Sp/Am

Source: WH Smith

TOP 3 BY MACHINE

1	Crazy Cavey	M. Tronic	Vc
2	King Tut	M. Tronic	Vc
3	Rockman	M. Tronic	Vc
1	Now Games	Virgin	64
2	Sky Fox	Ariolasoft	64
3	Summer Games II	US Gold	64
1	Now Games	Virgin	Sp
2	Way of the Exploding Fist	Melbourne House	Sp
3	Frank Brunos Boxing	Elite	Sp
1	Match Day	Ocean	Bc
2	Terrimolinos	Melbourne House	Bc
3	Beachhead	US Gold	Bc
1	On the Ball	Thorn EMI	At
2	Bounty Bob Strikes Back	US Gold	At
3	Pole Position	US Gold	At
1	Formula One Simulator	M. Tronic	16
2	World Cup	Artic	16
3	BMX Racers	M. Tronic	16
1	Repton	Superior	El
2	Overdrive	Superior	El
3	Football Manager	Addictive	El
1	Frank Brunos Boxing	Elite	Am
2	Syrus II Chess	Amsoft	Am
3	3D Stunt Rider	Amsoft	Am
1	Killer	M. Tronic	Ms
2	G. Busters	Activision	Ms
3	Pitfall II	Activision	Ms

Source: Websters Software

Write to: Your Letters, Your Computer, Room L221, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Our Prestel mailbox number is 019991800.

YOUR letters

Dear Sir Keith,



I would like to paint a small scenario. There you are early one morning eating your third Shredded Wheat. Your complimentary Daily Maxwell lies open on the kitchen table. The teachers pickets outside are still in their tent. Suddenly the peace is broken. A bulky figure plods up the garden path. It is none other than Chief Superintendent Robert Hay coming to feel your collar. Why?

This Conservative government, of which you are quite rightly a senior member, is responsible for many great achievements. The sinkings of the Belgrano and Arthur Scargill perhaps being the best known. Our concern however is two lesser known successes. The micros in schools scheme and the Copyright, Computer Software, Amendment Act 1985. It is the combination of these that will attract the attention of the afore-mentioned Chief Super.

The micros in schools scheme made two Cambridge based trainee businessmen unfairly rich. It also made our schoolchildren the most computer literate in the world. So far so good. The downside is that it has made our schools hotbeds of criminal activity. The problem is that the scheme has provided plenty of money for hardware and very little for software. Without lots of good software a computer is only useful as a paperweight.

It is not that teachers condone copying software. It is not even that they approve. The fact is that it is the teachers who are doing the copying. On the grand scale. Copying software is theft of intellectual property. Stealing. Just think of the effect on the moral judgment of our schoolchildren when they see that. Here are their elders and supposed betters, their peers in society, to look up to and emulate. Criminals.

These schoolchildren may be the most computer literate but do they know the right things? The fact is that the educational software market is a complete mess. The combination of lack of money and mass copying makes writing software for schools a waste of time. All the talent that could be writing educational software, raising our national educational standards, are writing games. They have to earn a living. Software piracy has led to the formation of the Federation Against Software Theft (FAST). The Federation has lobbied parliament and the result is the new Copyright Act. To enforce the act FAST has employed the gentleman from the scenario, Robert Hay. Anyone he catches copying software is liable to an unlimited fine or up to two years in jail. Surely as Secretary of State for Education there must be a degree of vicarious liability for the actions of your teachers?

Hence the scenario.

The solutions are straightforward. To provide hardware and not software is like providing text books with nothing but blank pages. For every pound spent on hardware at least two pounds must be spent on software. This might result in less hardware but it will definitely produce better educated children. Teachers must be sent directives not to copy software and those that do should be severely disciplined. If only to provide the correct moral example to their charges. The directive must extend to school computer clubs, where school equipment is used to copy the latest games under teacher's supervision.

This country needs a computer literate population to face the future successfully. This is the responsibility of you and your government. The above action is merely a step in exercising that responsibility.

Bruce Everiss

Bruce Everiss.

ALIENATING!

IT IS WITH growing concern that I note the ever-increasing popularity of the so-called "shoot-em-up" type of arcade game.

A craze which started with Space Invaders has now progressed to a cult dedicated to playing far more addictive and complex games. Why, you might ask, am I so concerned about this seemingly harmless pursuit? Well, let me elucidate...

During man's exploration of space, it is inevitable that, sooner or later, he will encounter extraterrestrial civilizations. It is imperative to man's survival that he realises the only way to approach these aliens would be peacefully, preferably followed by a scientific and/or cultural merger.

But when we are instilling into our populace the innate urge to destroy anything alien — through the aforementioned games, — we are simultaneously placing an ominous black cloud over man's very survival. An even more worrying facet of the shoot-em-up cult concerns terrestrial monitoring by alien beings.

We have absolutely no way of knowing whether the Earth is being monitored by a technically-superior civilization, but let's suppose for one moment that it is.

Now, assuming that they haven't gone through a similar "shoot-em-up" phase in their past, and that the very concept of a "game" is incomprehensible to them, then what do you think they will think when they see half the Earth's population squatting over VDUs and zapping pixelized aliens with an apparently insatiable gusto?

My guess is that they would be unlikely to permit the continued existence of the human species. Perhaps we could provide the answer to the problem by persuading computer firms to stop manufacturing these games.

However, I'm realistic enough

(continued on page 29)

Educational Software LCL



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Sorcery — Spectrum	Gates of Dawn — CBM 64
The Biz — Spectrum	Sorcery — CBM 64

Normal prices for BBC/CBM 64 products is **£8.95** except for Jungle Jive and Falcon Patrol **£2.99.**
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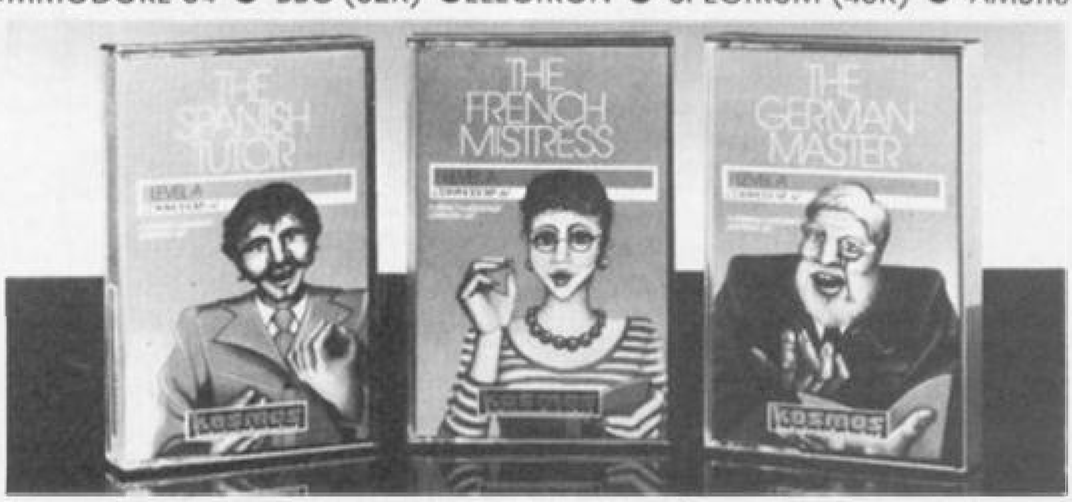
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IN★ TOUCH

How to write for *Your Computer*

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticisms of machines and software in general. Here's how you go about getting your name into print. Your article should be typed, double-spaced, on A4 paper. A name and address on each sheet would help. Don't forget to tell us which machine it runs on. With programs please include a cassette or disc and some indication of how long it is. Please put what machine it's for on the envelope. Don't forget full instructions to us how to load and list your program and how to enter it for the readers.

The article must be submitted exclusively to *Your Computer*. We pay £35 per published page — that's as it appears in the magazine and includes illustrations.

Telsoft

Telsoft is *Your Computer's* software downloading service. Any program for the Spectrum or the BBC — and soon the Commodore — which has a telephone symbol next to it is available on the service. Both 1200 and 300 baud speeds are catered for. For more details call Colchester (0206) 8068. No more lonely nights typing in endless pages of hex digits.

Message service

You can get messages to us in two ways. Either use the Prestel Telex Link to 892084 BISPRES G or you can use our very own modem, day or night on 01-661 8978. The modem is V21, 300 baud, even parity, 10 bits per character. You simply transmit in upper case "YRC" — our address code, and wait for the acceptance code "+ + + STF GO". Then off you go. Don't forget to tell us who it's for. Sign off with "NNNN" — again in upper case.

(continued from page 27)

to know that they won't, and hence the reason why I'm writing this letter. I'm pinning my hopes on two things: i). the aliens can read English, and ii). they subscribe to this magazine. If so, and they read this letter, then humanity will be able to breathe a sigh of relief, and once again continue on its weary path to eternity.

Harry Seldon,
Grimsby.

YOUR Letters



SCREEN DUMP

SCREEN DUMP — YC Software File, August 85 — will be welcome by ZX Spectrum/Interface 1 users as Basic screen dump routines take some 30 minutes to copy a screen. In fact, Brother HR-5 control codes do not fully match Epson ones so a half-height overprinted copy results from the unaltered code.

HR-5 owners need only change one byte at address 32829 from 04 to 08 hex to correct the routine for this popular printer.

A. J. Torlesse,
Helensburgh,
Dunbartonshire.

AMSTRAD ANGER

SO AMSTRAD have finally blown it! After introducing a strong influence of confidence and stability into the home computer market they have withdrawn the CPC-664 after just three months.

I am one of the unfortunate many who purchased the 664 and, after I read of the 6128 introduction, I thought that Amstrad would at least offer some means of upgrading the 664 to a 6128. Then I wondered what support would be available for the 664 in the future.

I wrote to Amsoft asking these questions and received a reply full of sales waffle which totally avoided answering these questions and seems to typify Amstrad's attitude to 664 owners. I would not be at all surprised if Amstrad had seriously miscalculated the date on which the 6128 development would be complete, which it almost certainly was when the 664 was released, and went through with the 664 launch in order to recover its development costs from the unsuspecting 664 purchasers.

I was amazed to hear Alan Sugar on *Database* stating that the 664 would be supported as it is compatible with the other Amstrad computers. What rubbish! I have already encountered compatibility problems with 464 programs, and 6128 programs will aim to use the extra memory so they certainly will not run on the 664.

Amstrad owes it to 664 purchaser to offer an upgrade or trade in on the 6128 and I hope other 664 owners and magazines like *Your Computer* continue to pressure Amstrad until they do.

Prospective purchasers of the PCW-8256 beware. What will you do if this is dropped after such a short period and after the 664 experience, can you be sure that Amstrad won't?

J. F. Palmer,
Crawley,
Sussex.

'BRAVE GAMBLE'

ON READING Stephen Meadows' letter in Octobers *Your Computer*, I was amazed at its content.

Mr Meadows explains to us that the TMS 9900 has an eight bit data bus, it does in fact have a 16 bit data bus. Its major handicap is that it has a 15 bit address bus which only allows it to access 32K of Rom/Ram directly.

He also claims petty reasons for the machine's failure, such as the position of the power switch. There are quite serious reasons for the lack of popularity:

☐ the machine was initially over priced, due partly to the high chip/descrete component count and partly to the bad marketing strategy.

☐ early models needed a special American monitor.

☐ the software was overpriced and I personally have never seen any third party softeware for the machine.

☐ the TMS 9900 chip was marvelously suited to control systems but not suited for a micro.

☐ the expansion was
a) all supplied by Texas.
b) expensive.

☐ the Basic was, to put it politely, double-plusmega-slowwwww — not to mention the dreaded Call extention.

I am not a fan of the QL or Uncle Clive, I crack up if someone says 28 days. However the QL was a brave gamble which would have paid off if the designers had used 3.5 inch drives instead of the Microdrives.

Sinclair is a pioneer but a little eccentric, though not completely incompetent.
6800 v 9900 ??????

For me its a 68000 every time.

D. M. Platt,
Maltby,
Rotherham.

Line 64504 in Listing 3 of October's Spectrum game, Impulse, was left out. It should read:
501617DCOAD718B1 = 711
In the same issue line 55 in Listing 2 for Midnight Express should read:
Q=0:FOR T=1 TO 39 STEP 2:X$=MID$(Z$,T,2):GOSUB 90

*To increase the number of lines available in BBC Pikchachamja it is not enough just to alter the value of NUMLN as suggested in the article. Instead, replace every occurance of C2 with C1+6*L, and delete the fourth statement in line 80. If you also replace BOO in line 750 with DOO you can have up to 80 lines.*

ADD-ON EXTRA

LP-1 Lightpen

CPC-464 or 6128
Amstrad
£19.95
Simple to use menu driven software for tape or disc that works in Mode 1 in 4 colours and Mode 0 in 16. Line drawing, box, circle and triangle facilities are provided as well as zoom and copying screens can be saved at either speed but dumping to printer is only on Amstrad's DMP1. A strategy game and use of the lightpen in your own programs instructions are included.

AMX Mouse

Graphics Package
Amstrad
£79.95
A conversion of the highly acclaimed BBC package for the Amstrad. For your money you get an art package, an Icon designer, and Basic extensions to allow you to use Mouse control in your own programs. Advanced Memory Systems are on 0925 602959/602690.

Delta

Second Processor
BBC
£115
This board consists of a 65C2 processor and 64K Ram. Watford claim that the board doubles the speed at which any program will run, and is 50 per cent faster than the official Acorn version. They also claim complete software compatibility. Tel 0923 3774/40588.

Pacesetter

Interface/Controller
Spectrum
£14.95
Space Invaders still zap you? Just can't get through that room in Jet Set Willy, well this could be the product you're looking for. You stick the Pacesetter in the back, and as well as a Kempston interface you have a control which allows you to slow a game down virtually to a standstill if desired. Any game which doesn't mess around with the interrupt procedures will respond to the treatment. Nidd Valley Micro are on (0423) 864468.

HARDWARE hitlist

Camel Polyprint

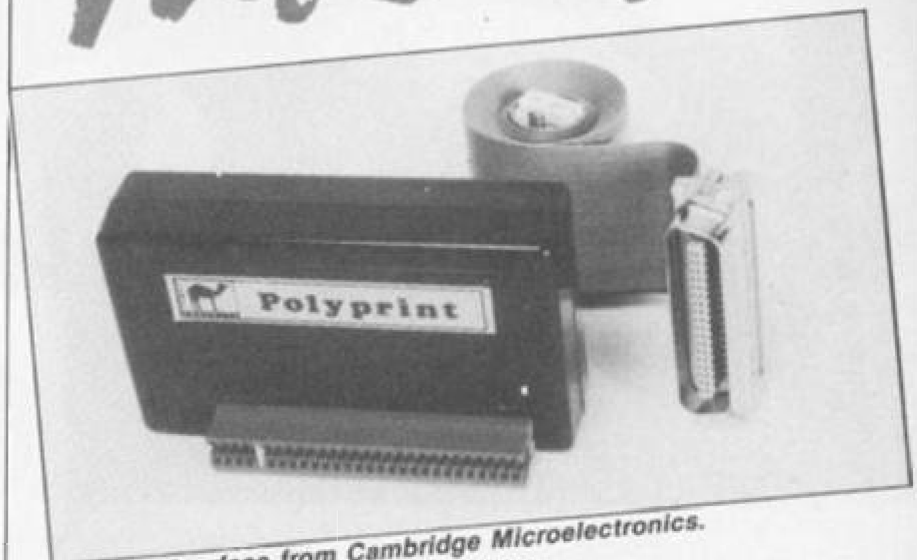
■ *Spectrum*
■ *Cambridge Microelectronics*
■ *£44.95*

NOT ANOTHER parallel interface! Yes, but this one's different. It will allow the usual LList, LPrint and small screen copy — bit image, somewhat oval circle — like the well-tried Kempston but without the option to copy using the printer's character set.

The customary and rather insubstantial add-on box with through port has eight 1K banks on Eprom, any 1K displacing the 15-16K area of the Spectrum Rom containing English, French, German, Danish, Swedish, Italian and Spanish, and a bank to change Tasword 2's character set to any of these.

It is specifically designed to be used with Epson's FX80, and Cambridge Microelectronics provide information to software switch the printer in conjunction with the character set changes. A list of addresses in Masterfile could thus be printed each in an appropriate character set. The unit is not cheap at £44.95 plus VAT.

However, for the specialist who wants a number of foreign languages and who doesn't relish poking Tasword 2 — I've done it and it takes a very long time — it's very handy. And the nicely mapped bits of Eprom can be used for other purposes — instructions are given for saving the character sets first. Not a hack interface, then, but rather one for the professional user or enthusiast. Cambridge Microelectronics is on 0223 314814.



Polyprint inerface from Cambridge Microelectronics.

Lightpen

■ *CPC-464 or 6128*
■ *DK'tronics*
■ *£24.95*

WITH THE right software, a lightpen is one of the most useful add-ons you can buy. Graphic design, control of games or business packages are all possible. So how does this offering from an established Spectrum hardware specialist measure up?

On loading the screen uses Mode 0 to display the five main menu's which you can step forwards and backwards through to select the various functions shown as small pictures or "icons". Screen's can be loaded or saved to cassette or disc although no catalogue function is provided.

The graphic software is not protected so that you can transfer it to disc or alter the speed screens are saved at. Drawing on screen is possible in one of 10 colours and four thicknesses as well as a nice air brush facility, although the lightpen flickers slightly fine movement of the cross on screen can be filled with any of the 10 colours but dark areas or backgrounds are best left till last as the pen has to be moved by the cursor keys across them.

Other facilities allow you to draw curves, boxes and circles and place text horizontally or vertically. Areas of the screen can be duplicated, reduced or enlarged in four set sizes. Fine detail can be achieved using the scratch pad which enlarges an area of the screen for editing of single pixels.

A comprehensive and well written manual gives full details of printing screen's using them in your own programs and writing programs to use the lightpen.

In conclusion a good hardware, software package that will appeal to most users especially the younger ones because of the use of icon's.

The lightpen is available from computer dealers or direct from DK'electronics on 0799 26350.

Rom card

■ *CPC-464 and 6128*
■ *Arnor Ltd*
■ *£10.39*

IT'S A BUMPER month for Amstrad add-ons as independent manufacturers realise there is a serious market out there. Perhaps Alan Sugar's truck driver's do a little word processing on the side. This Rom board takes four Roms and plugs into Arnor's Maxam assembler board; it's useless without it, but cheaper than the Micropower board.

To go with the Rom board, Arnor has launched two packages: Utopia, a utility package, and Protext, yet another word processor. Utopia might not transport you to paradise, but it does seek to patch up a few holes in the Amstrad operating system and the DOS.

Many of the commands will be familiar to Beeb owners, with Help, Spool, Printon, Romoff and many more, it therefore comes as no surprise it is from the author of Toolkit for the Beeb.

A particularly useful command is Romoff which allows any Roms you choose to be switched out. This saves you removing disc interfaces or other add-on's.

Utopia is £26.04 for a 16K Rom, and Protext £34.74. Protext is a comprehensive word processor, with the usual formatting and printer control functions.

In October's Hardware Hitlist page, Robcom was wrongly refered to as Robocom, a totally unrelated computer company. Robcom can be contacted on 01-209 0118.

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WHAT TO BUY FOR CHRISTMAS

THIS CHRISTMAS may well be a bonanza for manufacturers and consumers alike. Competition is likely to be extremely fierce with attractive deals on offer from most micro makers. Next month, we'll examine budget micro's making a bid for pride of place in the christmas stocking, this month we turn the spotlight on some more up-market machines in the price range of £180 and upwards which loosely come under the heading of home micro.

These range from the QL at its new highly competitive price of £199 all the way up to the ACT F1E and the recently announced Atari ST.

The table gives an outline specification of the 10 contenders. When talking about price, you must bear in mind what you get for your money. Many micros in this price range come complete with some form of storage, and perhaps a monitor or mouse. Next comes the amount of read only memory (Rom), random access memory (Ram), the type of processor and the speed at which it runs.

The amount of Rom gives some idea of the power of the machine's operating system and resident language, although it must be stressed that in the case of the Einstein and the PCW8256, the language is loaded in from disc after power-up.

Lee Padden tests possible Xmas presents.

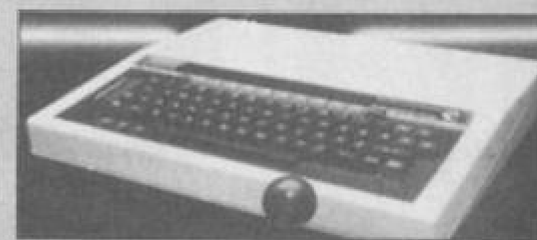
The figure for the Atari ST is provisional as the operating system is still being finalised at the moment, so it is only available on disc and not in Rom. Atari intend to produce a 260ST in the new year once the operating system has been sorted out, and this may well be around the £600 mark.

The processor and speed give some idea of the raw power of the system, although this is only a very approximate guide, ie despite the QL running a more advanced processor at twice the speed, its Basic is still slower than the BBC 128.

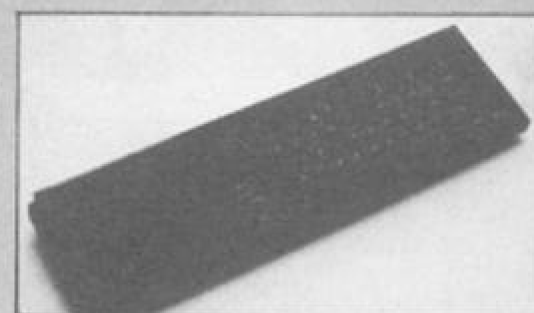
Graphics are still harder to be objective about. The figures given are the maximum in all cases. Usually, in order to get very high resolution graphics, colour or memory has to be sacrificed. It is also impossible to read 80 column text on a domestic TV.

The QL, F1E and 8256 have no sound save a very basic beep, usually to indicate a mistake of some variety. The rest either go with the ever popular General Instruments chip, which has a large, if not terribly subtle repetoire, or go

Machine	Price	Memory & processor	Display	Sound	Ports	Keyboard	Peripherals	Software
Amstrad PCW8256	£460 inc mono monitor printer & 3" disc drive	256K Ram — Z80A at 4Mhz	90 × 32 Text 720 × 256 Graph Mono	Beep		Full travel 4 function + WP keys	RS232	CP/M, WP, and GSX bundled
Amstrad CPC6128	£399 inc colour monitor printer & 3" disc drive	128K Ram 48K Rom Z80A at 4Mhz	80 × 25 Text 640 × 200 Graph 16 Col	Voices	Joystick, printer, disc sound.	Full travel 10 function/ number keys	RS232, speech light pen, TV modulator	Games, utilities and business progs. Quality much improved recently
Amstrad CPC464	£299 inc colour monitor & cassette	32K Rom 64K RAM Z80A at 4Mhz	80 × 25 Text 640 × 200 Graph 16 Col	3 voices	Joystick, printer, sound	Full travel 10 function/ number keys	RS232, speech light pen, TV modulator	ditto
Acorn BBC128	£499	128K Ram 48K Rom 6502 4Mhz	80 × 32 Text 640 × 256 Graph 16 Col	3 voices filtering & modulation	RS423, Print RGB, disc, joystick	Full travel, 10 func keys	Modem, speech 2nd processor mouse, net. Disc drive	Lots of utilities and business, few games.
Enterprise	£249 + Joystick	128K Ram 96K Rom 6502 at 4MHz	80 × 25 Text 672 × 512 Graph 256 Col	3 voices filtering stereo	Printer, RGB joystick, net cartridge	Membrane type, 8 func keys		Very little, mostly poor conversions.
Sinclair QL	$199 inc microdrives	128K Ram 48K Rom 68008 at 8Mhz	80 × 25 Text 512 × 192 Graph 16 Col	Beep	RGB, Net Cartridge 2 × RS232	Membrane type, 4 func. keys	Disc, modem printer, joystick	Bundled business software, some languages, few games.
Commodore C128	£269	128K Ram 64K Rom 8502 1 or 2 Mhz 16 Col	80 × 25 Text 640 × 200 Graph 16 Col	3 voices filter modulate	Video, cart serial, user joysticks	Full Travel, 4 Func, number keys	Disc drive modem light pen, mouse	CP/M compatible and can run most C64 software
Atari 520 ST	£750 inc 3½ disc + mouse + mono monitor	512K Ram 192K Rom 68000 at 8Mhz	80 × 25 Text 640 × 400 Graph 512 Col	3 voices + midi in, out & thru	RS232, joystick disc, cartridge	Full travel 10 Func + number keys	Hard disc modem	Business and games software in preparation.
Tatung Einstein	£499 inc 3" disc + momo mon.	80K Ram 8K Rom Z80A at 4Mhz	40 × 24 Text 256 × 192 Graph 16 Col	3 voices	Net, disc, printer, a/d RS232	Full travel 7 func keys	80 column displayd	Not much good software.
Apricot F1E	£685 inc 3½" disc	256K Ram 32K Rom 8086 at 5 Mhz	80 × 24 text 640 × 256 graph 16 Col	Beep	Printer RS232, RGB	Full travel 10 func + number keys	Hard disc modem	Mainly business, runs MS/DOS, and BBC basic progs.



BBC 128



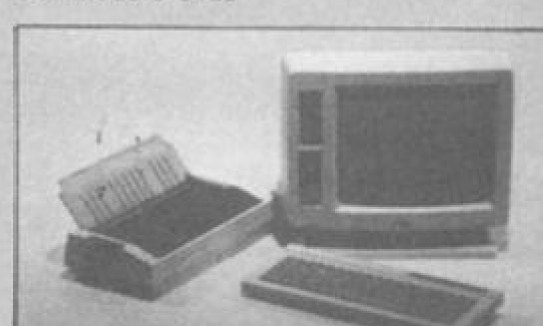
Sinclair QL



Amstrad CPC-464



Commodore C128



PCW-8256

for something a little more upmarket in the way of filtering and modulation.

Ports are a problem. Most peripherals such as disc drives, joysticks, printers and modems have a recognised standard port, which it seems micro makers do their best to avoid. Still, at leas this is some progress from the "leave part of the circuit board hanging out the back" approach common in cheaper machines.

The much maligned RS-232 interface is a case in point. Only the Atari has a "proper" 25 way connector. The BBC uses an RS-423 interface, which does the job, given the appropriate lead, but the QL uses a totally non-standard format, using phone-type plugs. Most joystick ports are of the "Atari" style nine pin format, the Enterprise needs an adapter. All except the Einstein, QL and Apricot have a cassette interface. Most machines also have an expansion port, but this is of little use to the average user.

You should certainly approach claims that these ports are standard with a fair degree of scepticism, and work out the real cost of attaching any gadgets you've got your eye on.

Keyboards are not usually a problem in this price range. With the possible exception of the Enterprise, the Einstein and the QL there should be few complaints. The BBC in particular has attracted warm praise from key bashers everywhere. The table mentions extra functions keys available over and above the Qwerty set, the obligatory shift, delete and escape keys. A numeric keypad can often speed up data entry.

One unique problem with the F1E is the keyboard is coupled to the main unit not by a cable, but by an infra red link, so you have to keep a nice tidy desk for this one.

Peripheral availability is rarely a problem with established micro's like the BBC, and most manufacturers give their machines hardware support.

If an RS-232 add-on is available, the machine should be able to use most modems, assuming suitable software is available.

One of the most important factors when choosing a micro is software. After all, unless you're going to get down to programming the thing yourself, how good the machine seems to be to you will largely depend on how good the available software is. Many a potentially good machine has ended up on the scrap heap for want of good software. It is always difficult to gauge how good software support is likely to be for a new machine.



Above: Atari 520 ST. Below: Enterprise 128. Below right: Amstrad CPC 128.





PCW8256: A specialised word processor rather than a true home Micro, amazing value for money, no resident Basic, monochrome low res graphics. Bundled software includes Dr Logo, CP/M+, and GSX — a graphic system.

CPC6128: Possibly the best all round buy this Christmas for someone who wants to get into computers, has a bit of word processing or data handling to do and is not averse to playing the odd game. Hard to fault at the price. Easy to use, fast Basic, rather rudimentary disc system, and a flood of interesting peripherals arriving.

BBC 128: Looking a bit long in the tooth now, Beeb has changed little since its launch over three years ago. It has a massive cult following among hardware freaks. Software is rather patchy with the odd really stunning title among the froth. Perhaps the sudden expansion in memory will stimulate the software market a bit. The best machine for communications.

Enterprise 128: First rumoured to be on the way in 1983, after a long gestation, it was virtually stillborn. May still recover given a stiff transfusion of good software. Technically superb, it probably represents the end of the line in the evolution of the eight bit home micro.

Act F1E: A cut down version of Apricot's highly successful F1 business machine, it will not only run Apricot's range of business software, but also most programs written in BBC Basic in a bid for the education market. Runs MS-DOS, the most widely used PC operating system.

Einstein: While by no means a bad machine, the Einstein has been unable to make much of an impression on the market and has little third party software support. A bit bulky, it runs CP/M but needs an add on 80 column graphics board to give it full compatibility. Disc software on the pricy side.

Atari 520 ST: Very much an unknown quantity at this stage, possibly a better bet for next christmas. Still, if you must have the best set of wheels on the street, this is definitely the micro getting the most column inches devoted to it at the moment. If it's all true, with a user friendly operating system, MIDI and superb graphics, it'll be a huge hit.

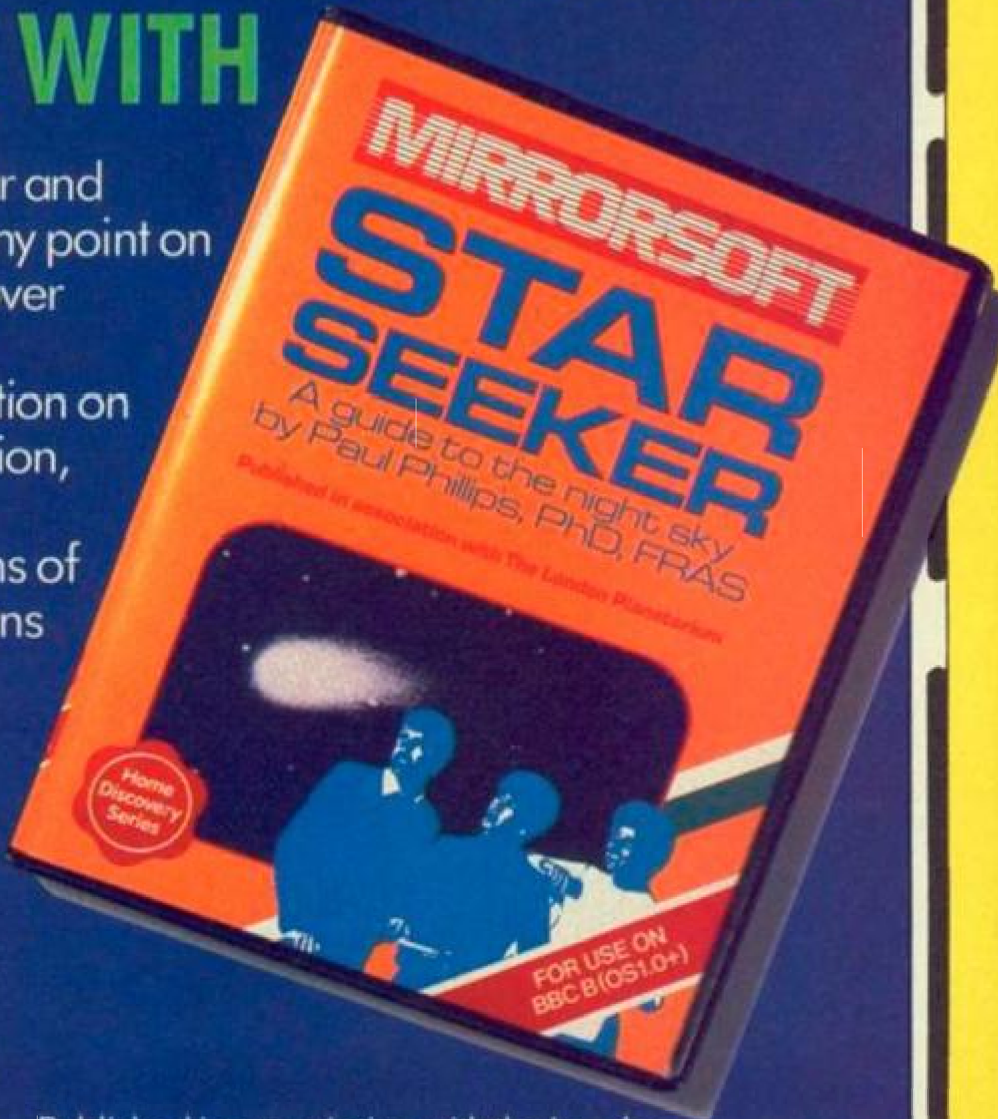
Commodore C128: As yet it isn't certain this will be around in time for christmas. Compatible with all CBM-64 software, with CP/M thrown in for good measure, it has superceded the C64 in the States, and presumably will do here as well, once Commodore have got rid of their stocks of CBM-64's. May well be a good compromise between a business and games machine.

Sinclair QL: Virtually given up for dead after an apparantly never ending series of teething troubles, the price cut and the new improved versions of the bundled software might just rescue this one from the realms of academic curiosity piece. Slow and cumbersome Basic, awful keyboard, and of course Microdrives. Monitor be specially adapted.

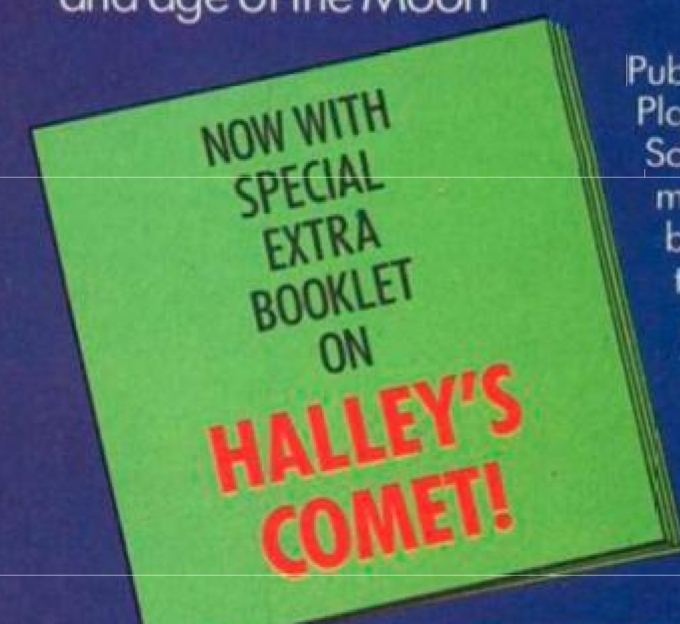
Amstrad CPC464: Older brother of the 6128, it suffers in comparison. But if £300 is your absolute limit, and you're happy with cassetes, you could do a lot worse. If you want a printer, make sure its the new 2000 rather than the awful DMP1. ■

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MIRRORSOFT

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SOFTWARE Shortlist

BEHIND THE SCREENS



Andrew Braybrook.

Andrew Braybrook, author of Paradroid, first started games programming the hard way — in Cobol on a mainframe, when working as an accounting packages analyst/programmer at Marconi in Chelmsford. Pioneering real-time computer games with Space Invaders built out of greater-than/less-than signs was good schooling for getting the best out of the Commodore 64. "On the mainframes there were no real graphic facilities, and the action only took place when you tapped a key. That Space Invaders game as the first one at Marconi that went on playing by itself."

Initially the Paradroid backdrop was planned to be a plain blueprint. but Hewson decided this would look too primitive. Having experimented with a pressed metal title screen, Andrew extended the concept to one deck, then to the whole ship.

How did the game's transfer sequence come about? "I couldn't think how to show the takeover so I thought of making a little game out of it. Steve (Turner) was playing about with one of those logic circuit designing programs on the Spectrum and I thought I can use this."

And the smooth-etc scrolling? "It doesn't scroll the screen as such. You would need to access all the screen area. We found that's OK if you just go up and down or left and right but if you go diagonally you get a sort of step effect. So we refresh the whole of the screen all of the time, 17 times a second."

Paradroid

- *CBM-64*
- *Hewson Consultants*
- *Shoot-'em-up*
- *£7.95*

★ ★ ★ ★ ★

THIS IS PROBABLY the most original and striking game to appear from a dark horse software house since Llamasoft released Gridrunner. And it is far more than just a shoot-'em-up, though a certain amount of zapping is essential to survival in this highly addictive game.

Your paradroid materialises on board a space freighter where mutiny if rife among the robots. Your job is to clear each deck of the dissident droids. You can either shoot them in the traditional way or take them over. You start out as a humble 001 influence device but you can work your way up through the social scale by taking over insignificant 123 disposal droids, 249 servants all the way up into the eight or nine hundreds. All the different types of droid are represented on the main screen as floating numbered globes, but when you taken one over you get a portrait of the machine you are and the one you are about to become together with specifications.

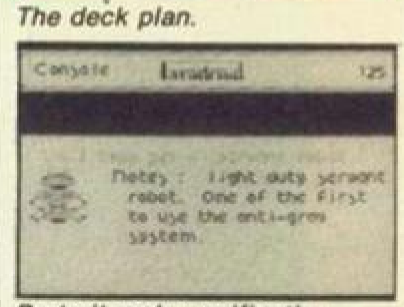
The takeover sequence is highly original and calls for a deal of quick thinking and pattern recognition. First you centre your joystick — your current host changes colour, then crash into your proposed victim. The description screen appears, followed by a screen depicting the logic circuits of the two machines divided by a central segmented column.



The 476s are vicious.



The deck plan.



Portrait and specification.

By moving the joystick up and down and firing charges along the circuits the aim is to turn the central column to the colour representing your side of the screen. If the victim puts up a fight the struggle can end in deadlock, rejection or burnout. If you die, a whole load of static comes up on the screen followed by the message "Transmission terminated". Another nice touch of sophistication in this program.

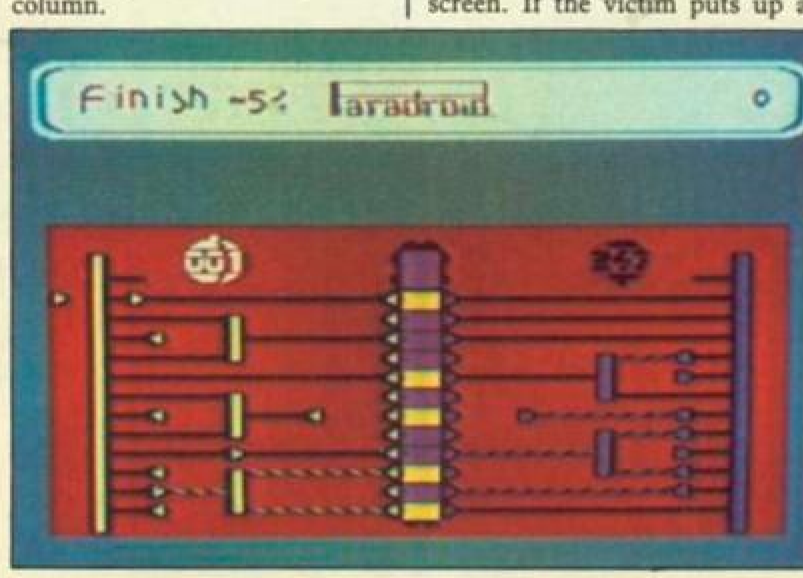
There are 24 classes of robot. Each has its own personality — the 476s are very aggressive and hang round in gangs quite often shooting each other if they get carried away — but they are nowhere near as mean as the 711s which pack disrupters capable of blowing up everything in the vicinity.

The toughest robot of all is the 999. The only way to take this out is to take it over. It is, however, very resistant to your influence so transfer to another robot before it rejects you — there is no lonelier feeling than turning back into a 001 on a deck full of 716s, except possibly catching a train from Shrewsbury which turns out to be full of West Ham supporters.

When the last droid on a deck is eliminated the deck lights go out and the strange background warbling noise — which sounds like someone calling "here, kitty-kitty" dies away and you score bonus points.

With over 400 screens of playing area and 20 decks at £7.95, there are eight spaceships, plenty for your money. Hewson has come up with the goods just when some of its fellow little league colleagues seem to be nightshades of their former selves.

Paul Bond.



Takeover sequence — you'll need to think fast.

(continued on page 39)

Star chart

KEY

★ ★ ★ ★ ★ Best of its type
★ ★ ★ ★ Very good
★ ★ ★ Good
★ ★ Average
★ Below par

Interactive Basic Programming

ZX Spectrum
Eigen Software
Educational
£9.95

★ ★ ★

A very useful set of four cassettes which instead of letting books blow your mind, allow your computer to do it for you. Permitting you to type in and program normally while IBP is resident in the machine, it tries very hard to be a blow-by-blow introduction to hands-on home computing.

I think you would have to hang on to your manual — I'm sure most real novices need to have it pointed out to them that there actually is a Beep key, and if you try to type in Beep, all you get is Border BBB, because there are so many other keys to press first.

But common sense permitting, this looks like a very useful guide for beginners provided they can find a human to help them out when they're really stuck.

Seventh Cavalry

ZX Spectrum
Strategy game
Black Knight
£3.50

★ ★

For only £3.50 you don't expect to get wonderful moving graphics. This gives you basic map screen display with very slow-responding commands. Your troop units are represented by letters of the alphabet.

Watch out for the letter I as this stands for, guess what, Indians: it streaks across the screen and massacres all the Bluebellies. Good luck to 'em, I say.

(continued from page 37)

Stealth

- *CBM-64*
- *Ariolasoft*
- *Strafe-'em-up*
- *£9.95*

★ ★ ★ ★

BUCK ROGERS, EAT your heart out. Broderbund's Stealth, now available from Ariolasoft in the United Kingdom, takes the fast-scrolling-flying-straight-down-a-corridor-shooting-at-things format and turns it into quite an addictive scenario. The screen display depicts the rear view of your fighter as it hares at zero feet across the hostile landscape.

In the distance the dark tower casts gloom over the future of your once-proud people. You must blow it up so that they can go back to their former cultural pursuits of bean-eating and watching "V" instead of cowering in the bunker.

You can bank left and right but you cannot change altitude. Nevertheless, the sensation of speed and manoeuvre is exhilarating. You can despatch bunkers, tanks and scouts with gusto and a well-placed rocket. Past the third level you come under attack from heat-seeking missiles which you can dodge by veering to port. At the fourth level, fighters come at you and dormant volcanoes start to figure prominently as features of the landscape. On the elusive fifth level these spew forth lava and present a general traffic hazard.

The scouts are particularly interesting. They bounce down from the sky, accompanied by a ground shadow and then zoom up again, adding a bit more perspective to what might otherwise be rather flat visually.

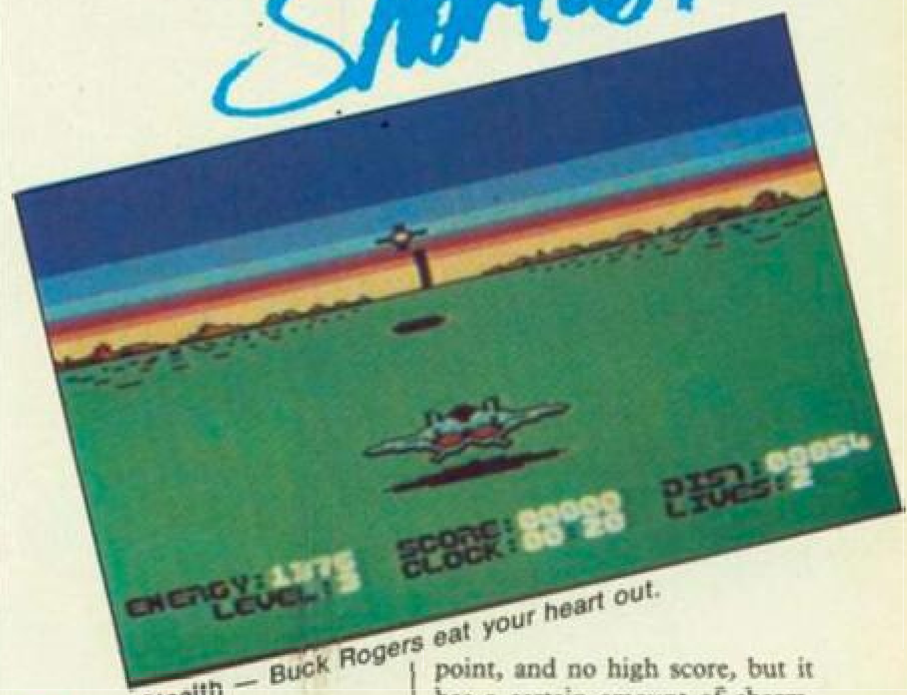
A couple of rather pale attempts at this kind of thing appeared on Dragons and Commodores 18 months back, followed by the release of the actual Buck Rogers game by which they were inspired. I am sure the concept could be stretched a little further but this is one of the most playable variations I have encountered.

Paul Bond.



Donald goes shopping.

SOFTWARE *Shortlist*



Stealth — Buck Rogers eat your heart out.

Donald Duck's Playground

- *CBM-64*
- *Transatlantic Simulations*
- *Educational*
- *£9.95*

★ ★ ★

THOSE BOYS at Centresoft again, cunningly launching a new label to cover up the fact they're taking over the entire software market. The spurious reason behind this is that the new label is aimed at a younger market.

This game sets out to teach youngsters the basic ideas of work, money, and buying things with money to build a playground — all good sound stuff which will doubtless come in handy in Reaganite America.

There are four different jobs to try your hand at, fruit packing, cargo handling, stacking shelves and signalman. You book Donald in for a shift from one to five minutes, and perform the various tasks. You get paid on a strict productivity basis — with no tea breaks.

After that, its off to Goofy's junk store, or Minnie's hardware store, to buy slides, ropes, ladders and so on for the Playground. After you've picked the item you want, you have to profer the correct change.

All this is done with pretty 3D graphics showing the various cartoon characters strolling around the screen. There is no real aim, in the sense of finishing point, and no high score, but it has a certain amount of charm, and will doubtless appeal to the 5-7 age group it is aimed at, and might actually teach something, like if you vacuum the living room, you might get a pocket money raise. Could this be the start of education programs which actually keep their audience switched on long enough to teach them something?

Lee Paddon.

Blast Compiler

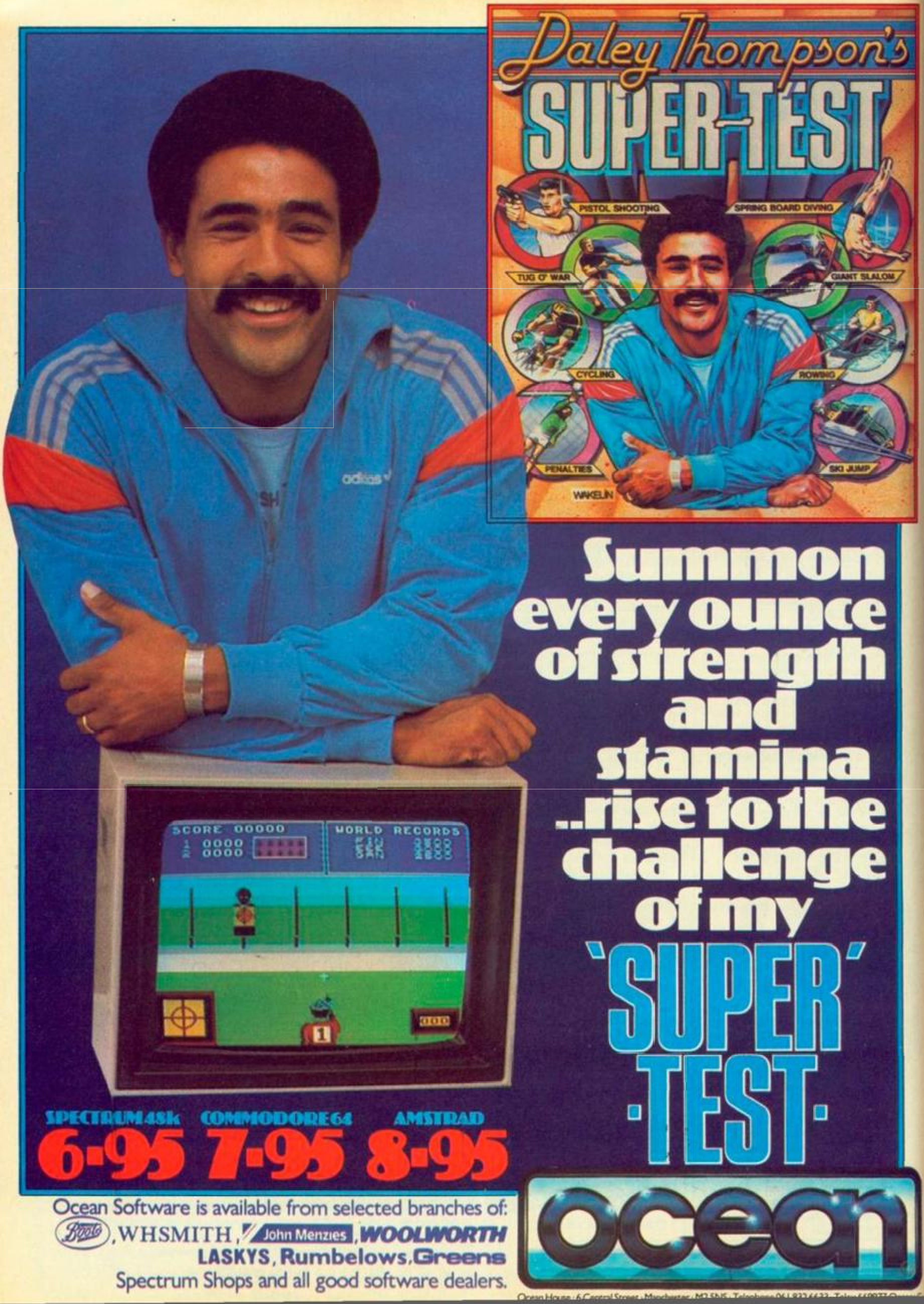
- *Spectrum 48K*
- *OCS*
- *Utility*
- *£26.95*

★ ★ ★ ★

THE IDEA of writing a game in Basic and then getting some dumb compiler to speed it up for you is enough to make some machine code purists take to the veil. But, for the rest of us, this utility could put an end to long nights hunting for an elusive bug which resets the machine when you shoot the fifth invader from the left on the third screen. There have been several Spectrum compilers before, but none have claimed to be as comprehensive as this.

On loading up, you are greeted with the cheery message that around 2K of the memory is free. So, any program to be compiled must be loaded section by section, compiled, and then saved; Microdrives are a must here. You can either compile into machine code, or p-code. P-code has the advantage

(continued on page 41)



Daley Thompson's
SUPER-TEST
PISTOL SHOOTING
SPRING BOARD DIVING
TUG O' WAR
GIANT SLALOM
CYCLING
ROWING
PENALTIES
SKI JUMP
WAKELIN
Summon every ounce of strength and stamina ..rise to the challenge of my 'SUPER' ·TEST·
SPECTRUM 48k 6·95
COMMODORE 64 7·95
AMSTRAD 8·95
Ocean Software is available from selected branches of:
Boots, WHSMITH, John Menzies, WOOLWORTH
LASKYS, Rumbelows, Greens
Spectrum Shops and all good software dealers.
ocean

Star★chart

Elevator

ZX Spectrum
Platform game
Black Knight
£3.50

★ ★

The horrible Turling dromes have planted 15 time bombs in the kind of architecture you only find in platform games. Defuse the bombs in the correct order and in the specified time.

A faithful recreation of the early days of home computer gaming at a not appreciably reduced price. You have been warned.

Highway Encounter Amstrad CPC-464

Amstrad CPC-464
Vortex
Arcade adventure
£8.95

★ ★ ★ ★ ★

Brilliant Spectrum game re-implemented for the 464, enough to make you hang on to the old machine instead of rushing out and buying a complete wordprocessing system. You guide a crocodile of demented dalekoids up a Zaxxonesque 3D highway through zones of increasing hostility from totally indescribable things.

As lead droid you must defend the rest of them until you get your ultimate weapon into the final zone and drive these monsters from the planet's surface.

Lords of Midnight

Amstrad
Amsoft
Adventure
£9.95

★ ★ ★ ★ ★

Even a year after the launch of the Spectrum version, this game still looks state-of-the-art. You have to defeat the forces of evil by either going on a quest or recruiting a huge army and defeating them in battle.

(continued from page 39)

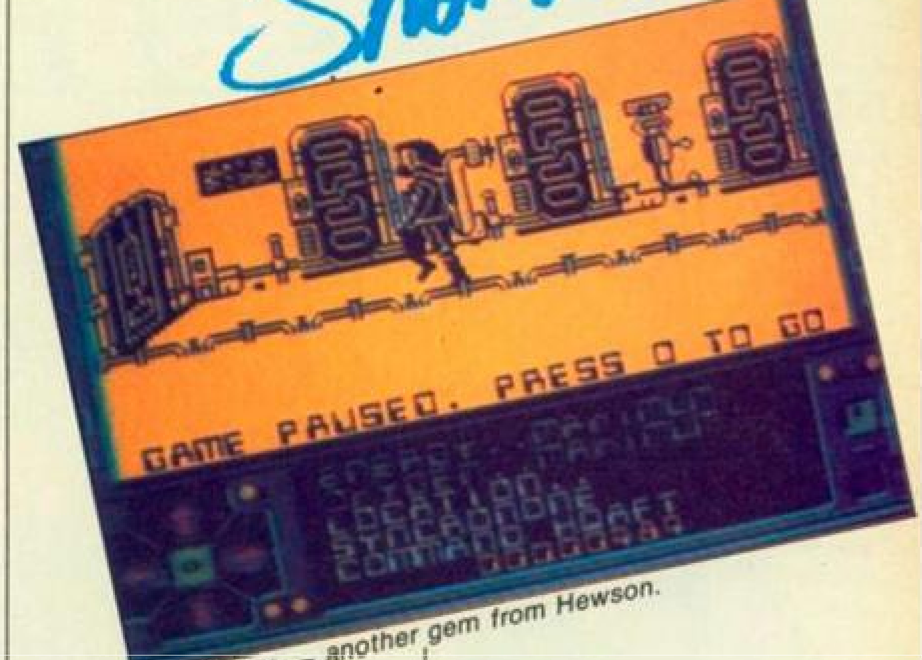
of being more compact than machine code, or even sometimes Basic, and, as an undocumented language, may be fairly secure against hacking.

However, it is slower; for this reason, sections of the program can be compiled into machine code. Obviously there are some things which are best done in machine code, and Blast allows users to call machine-code subroutines, and will compile user extensions to Basic. The package is supposed to contain extra Basic commands, but these have been left out due to space; but you do get a useful toolbox of editing commands.

It is difficult to gauge the performance of this program. OCS claim that speed improvements of up to 40 times are possible. This obviously depends on the length of the program, the amount of calculation, and the way the program is written. The manual is currently undergoing revision, but the version with the review copy was hard work. Despite this, it seems that Blast has lived up to expectations, and is by far the best Spectrum compiler on the market. OCS is on 0993 812700.

Lee Paddon

SOFTWARE Shortlist



Astro-Clone — another gem from Hewson.

Astro-Clone

- *Spectrum*
- *Hewson Consultants*
- *Arcade adventure*
- *£7.95*

★ ★ ★ ★

ANOTHER GEM from Hewson matches variety of gameplay with excellent animated graphics. Supposedly the third part of Steve Turner's Dragontorc trilogy, it is obviously something quite different, but is none the worse for that. The game is split into strategic, space combat and ground combat phases. The ground combat phase is where you are on the opening screen, with your Astro-Clone in his two-room spaceship.

On the lower part of the screen lies the control panel. To the left is an icon panel; this tells you what effect the joystick has at any point in the game. There is a message screen next to this, and to the right of this two square alert lights. The top one goes red to draw your attention to the message screen. The lower one goes yellow if those old Hewson bugbears the Seiddab are in the next room, red if they join you.

Your mission is to destroy the main launch computers in all the Seiddab bases to gain control of the stargate sectors shown on the strategic map. But before you access the strategic phase you must take off, enter the space phase — a Defender-style sequence and eithe. dock with a Seiddab starbase or slip through the pulsing diamond stargate to another sector. Either way you have to destroy all the Seiddab cruisers first.

If you fly through the stargate, you enter the strategic phase. If you dock with a starbase, you enter the ground combat phase again. In ground phase you have four modes, selection, movement, arm and laser. The arm mode is quite a nifty bit of programming which allows you to control and throw objects in a way unique to this game.

The game requires tortuous problem-solving capabilities — you need to be able to figure out that if you pass the Gravimag over the grating in room 8 a sonic key appears, for starters. And since the location of seven of the starbases change every time the game is played, the game is always slightly different. Publishing a solution for this game is going to be a bit more complicated than it is for something like Nodes of Yesod.

Hewson have excelled themselves once again — full credit to Steve Turner for producing a game that is destined to become one of the cult non-Ultimate adventure games at Christmas. If only because they've actually brought the game out, unlike some of their more flashy big brothers who are good on hype but slow on delivery.

Paul Bond.



Get your kicks with Karateka.

Karateka

- *CBM-64*
- *Ariolasoft*
- *Martial arts game*
- *£9.95*

★ ★ ★

WAY OF the Exploding Fist it isn't, but Karateka has plenty of Oriental charm. Of particular note is the film-like narrative technique: a kind of story is told in the preamble to each fight sequence — we see Princess Mariko thrown into the dungeons by the evil Akuma, and in later sequences we see Akuma sending his henchmen out to work you over as you try to rescue the unfortunate girl.

As rescuer and henchmen approach each other the hypothetical camera cuts between them until they appear on the same screen. You can shorten this process by running forward but it's not advisable as a good kick in the running mode floors you completely.

And here we encounter a major gripe concerning this program. Obviously not wishing to endure the blood, sweat and tears not to mention time consumed in

(continued on page 43)

Star★chart

Duckworth Highway Code

ZX Spectrum
Duckworth
Educational
£11.95

★ ★

Competent enough question and answer program, though questions along the lines of is it a good idea to drive with badly-maintained brakes? tend to rather lead the user to the correct answer.

The package contains two programs to test and improve your knowledge of the highway code, from the points of view of pedestrian and road user, together with special rules for cyclists. Prepared with the co-operation of Thames Valley Police

The Castles of Doctor Creep

CBM-64
Platform game
Ariolasoft
£9.95

★ ★

House hunting is no fun anywhere, let alone in Transylvania. You've made an appointment to visit 13 of evil landlord Dr Creep's castles with a view to purchase.

Not a wonderfully original setting for a standard platform game. But if you like roaming acres of haunted east wings then this game will certainly give you value for money.

The only catch is that it's unexciting to play — mapping out a whole castle so that you can escape requires a lot of to-ing and fro-ing and repetition.

Mummies and Frankenstein monsters hamper progress, together with plenty of very un-supernatural-looking ray guns and force fields.

Despite the large number of castles to choose from all the rooms are made up of the same components — trapdoors, ladders, doors and sliding poles.

Marginally more enjoyable than moving house in real life.

(continued from page 41)

producing the excellent tape version of Ariolasoft's Skyfox, the cassette version of the game is rather hastily implemented. Every time you lose, you must reload. A highly depressing experience — especially if you do something really dumb, like walk backwards off the cliff at the beginning of the opening sequence. I was only testing the joystick, guv. It takes two and one quarter minutes to reload the game — enough time to play a track off your latest Durutti Column album.

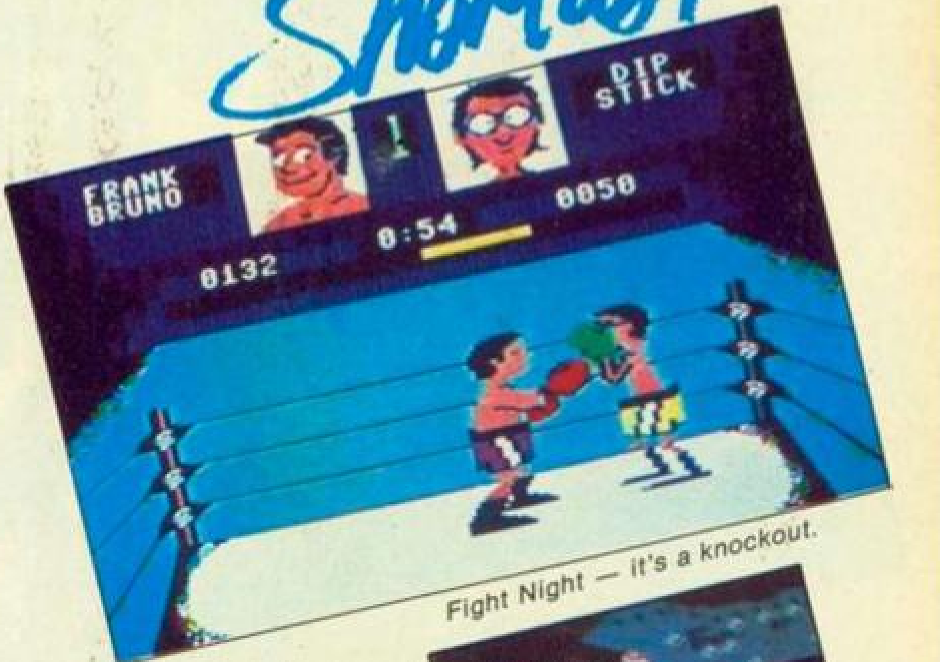
Anyway, if you manage not to fall off the cliff, a member of the local meat-squad turns up and starts chopping away at you. The animation of the figures is slower and more graceful than that in Melbourne House's Fist, but they are smaller, and there is less in the way of sound. The type of blow is restricted to kick and punch, controlled by how you squeeze the joystick button; the stick itself controls altitude of kick — high, middle, low.

You can withstand only a limited number of hits from your opponent. The row of red arrows across the base of the screen indicates how much stamina you have left. Every time he hits you, you lose an arrow. Conversely, the blue arrows on the left of the screen gauge his strength. Each guard wears different headgear and has a different fighting style.

Once you cross the porch the scenario shifts indoors. This also means loading a new section of the game. Here more of the same goes on except that the warlord's pet eagle has a go at you as well. So the moral of the story here is — watch the birdy.

Paul Bond.

SOFTWARE *Shortlist*



Fight Night — it's a knockout.

Fight Night

■ *CBM-64*
■ *US Gold*
■ *Boxing Game*
■ *£9.95*

★ ★ ★ ★

THE WELTER of boxing games continues unabated. First the crisp job of Rocco, then the swinging upper cut of Frank Bruno, but US Gold reckons it can deliver the knock out blow with Fight Night, despite the rather punch drunk nature of the market.

Once the game loads, you are faced with a menu. You can "construct" a boxer, train him, do a bit of sparring, take on a series of progressively tougher challenges, or fight a tournament, several players taking one boxer each.

The important part of construction is to decide whether to make your jab or body blow hardest, and which part of your body can take the most punishment. You also get to choose the colour of your trunks and even skin (including blue, presumably to cater for any aliens who might care for a bout or two).

The actual fight simulation is probably the pick of the bunch. From the ring side seat view, the boxers move back and forth, move their guard up and down, punch and jab. This is no slugfest either, timing is all important. Landing a blow has a number of important effects, it scores you points, it decreases your opponent's endurance, and it puts him off his punch, so a flurry of punches can have a devastating affect, each new punch sending the opponent reeling. Obviously the punch has far less effect if blocked by the opponent's guard, and it is also affected by what the opponent was doing at the time, stepping out, moving in or punching.

There are three three minute rounds, and if no one can deliver a knock out in that time, a decision is given on points. The animation is very nice, with boxers reeling from the punches, and the computer controlled characters have a "special" punch which is great fun to watch (from a safe distance).

Well, Harry, perhaps not a knock out, but I'd say that I've got this one winning all the later rounds after getting away rather slowly and coming out on top in the end. A real contender for the title.

Lee Paddon.



Racing Destruction Set.

Racing Destruction Set

■ *CBM-64*
■ *Ariolasoft*
■ *Race Game*
■ *£12.95*

★ ★ ★

REMEMBER SCALEXTRIC? You probably had more fun designing and building the track than actually racing. The cars kept coming off and ending up as a pile of twisted plastic against the skirting board, or worse, you'd get a short circuit and the transformer would blow up. Well, this game is rather similar, most of the effort goes into designing the track, with curves, cross overs, jumps, flyover and so on. You can also customise the car, anything from a fully fledged racing machine to a Morris Traveller.

But then you get to the actual racing bit. A split screen, one or two players, a plan view of the road! I'm afraid this will take a lot of selling to the Pole Position fraternity, used to an over-the-shoulder view. Despite this, it's quite fun, with the usual accelerate, brake and steer.

The jumps are a nice feature, you have to approach these at just

(continued on page 45)



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Star★chart

Xcel

Spectrum 48K
Program Tecniques
Shoot-'em-up
£7.95

★ ★ ★

After one of the prettiest loading screens in Spectrum history, you would expect a pretty devastating game. A log zaps in from both sides of the screen, wow, this must be some game, you start orbiting a planet ready to whiz down onto the surface for a dazzing 3D shoot-'em-up, right? Sorry, wrong.

As long as you don't actually try to play this game, you might think it was something pretty special, but underneath it all is a sort of cross between Zalaga, Galaxians, and every other shoot-'em-up all the way back to Space Invaders. There is a spurious plot and a lot of spurious alien writing which you're meant to pick up clues from, but the guts of the game are to shoot anything that moves, or, on other screens, avoid the trees — simple really.

Ace

Commodore 64
Cascade
Fight emulator
£9.95

★ ★ ★

When Air Combat Emulator was released for the C-16, it filled a need for software, let alone flight simulators for that machine. It's up against tougher competition on the CBM-64, so a few more goodies have been injected into this fight and fly scenario. You can brush up your in-flight refuelling and choose different weather conditions. There are ground and naval targets as well as hostile fighters. It has a co-pilot option and synthesised speech which keeps the crew informed as to their status. One guy does all the flying and the other does weapons control. Tanks, helicopters, SAM sites, all the fun of a serious deterioration in East-West relations is here.

(continued from page 43)
the right speed to come down on the reverse slope of this or the next jump. If racing soon looses it's appeal, then you can always shoot the opposition off the road! This does tend to make the races rather short, but fun.

While this game has got plenty of chrome, with loads of different tracks and cars, it doesn't grab you the way Taledega did.

Lee Paddon.

SOFTWARE Shortlist

Adrian Mole

- *Various*
- *Level 9*
- *Adventure*
- *£9.95*

★ ★ ★ ★

September 30: Adrian Mole computer game arrived today. Looks really great. All the old characters there, Pandora, Rat Fink Lucas, Stick Insect, Barry Kent and the rest of the gang. The idea is to make Adrian popular.

October 1: Still playing Mole. Editor starts making noises about deadlines. I said that with over 20k of text loading in four parts, it really needs a long review to get to the bottom of it. He seemed pretty impressed. Managed to get through the game without getting beaten up and scored 55 per cent which makes me a spotty school boy. Its got a load/save option so it didn't matter when the cleaners threw me out at 9 o'clock.

October 2: The editor came to find out how the Mole review was going. I said I was seriously thinking about getting down to it. The game uses a tree structure you see. You make decisions and these affect your rating, and also what happens next in the game. So in one game you'll probably only see about a third of the text.

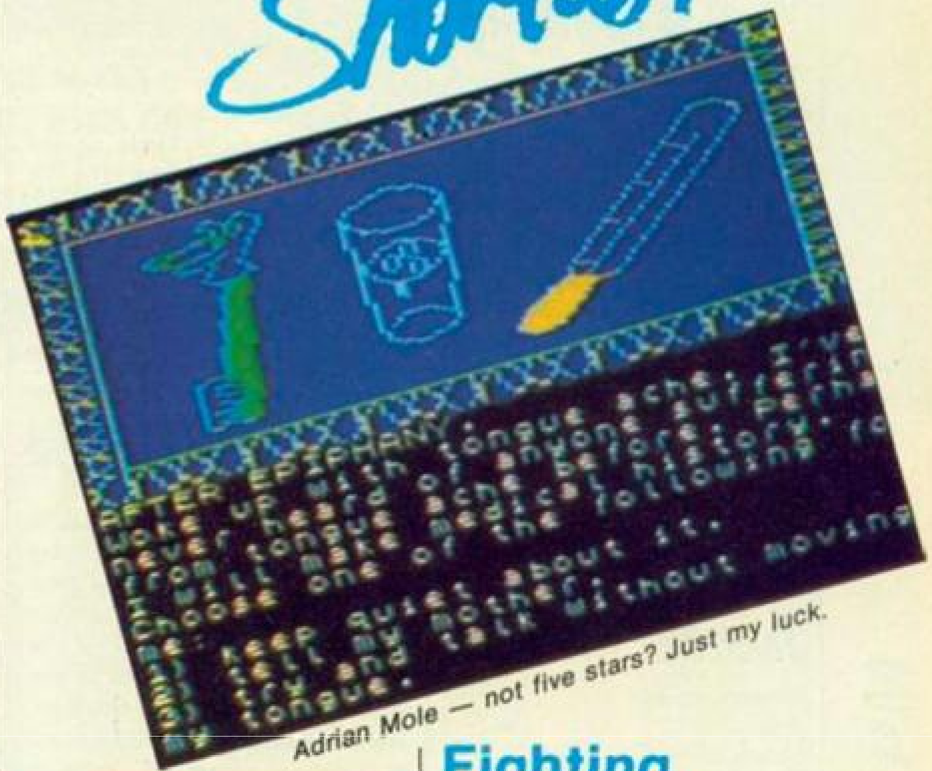
October 6: The editor just doesn't understand me. Here am I trying to write a masterpiece that will live for ever and all he can think about is his deadline. He just doesn't appreciate that I am a great writer and not just another hack. Even if you've read all the books and stuff, there are still plenty of new situations you can get in. I have now managed to score 78 per cent which makes me a gifted poet.

If you don't know the books, there's a Help system, which gives you some background.

October 9: Magazine going to the printers but, unfortunately, I feel the review still needs a little polishing.

October 10: Get the sack. How ungrateful can you get.

Lee Paddon (aged 13¾).



Adrian Mole — not five stars? Just my luck.



Fighting Warrior — state-of-the-art graphics.

Daley Thompson's Super-Test

- *ZX Spectrum*
- *Sport simulation*
- *Ocean*
- *£9.95*

★ ★ ★

When Daley Thompson was momentarily dethroned as the world's top decathlete he is rumoured to have said "I lost my world record and took it like a man — I only cried for 10 hours."

Whether or not Ocean's follow-up to the enormously successful Daley Thompson's Decathlon will bring tears to your eyes, it will wreak havoc on your joystick and/or keyboard. Yes, it's another joystick waggler.

The program features eight events only — and suffers strong competition from other sports simulations like US Gold's Summer and Winter Games, not to mention Activision's old Decathlon and the Tour de

(continued on next page)

Fighting Warrior

- *Spectrum 48K*
- *Melbourne House*
- *Beat-em-up*
- *£7.95*

★ ★ ★

"The best graphics ever seen on a Spectrum", a familiar line in publicity blurbs. But now there is no excuse. Stephen Cargill has upped the stakes once again with cartoon style animation of stunning smoothness and detail.

You have to rescue a princess again (groan). In order to do this you've got to fight your way through a veritable army of monsters, who, being honourable types, come at you one at a time. Just to add to the fun, arrows come hurtling at you as well. You have three sword strokes, walk forward, back, jump and duck. The controls are easy to get the hang of.

The screen scrolls right to left as you attempt to make your way to the cave where the Princess is incarcerated. In the background, a landscape of Pyramids, temples and sphinxs scrolls past.

The fight sequences are beautifully animated, easily surpassing those in "Fist" or "Frank Bruno". Unfortunately, the process of fighting your way through the local heavy mob is a shade boring. Still, perhaps we can hope for the same sort of technique to be used on more complex and absorbing games.

Lee Paddon.

Star★ chart

Sorcery +

Amstrad
Amsoft
Arcade adventure
£13.95

★ ★ ★ ★

One of the prettiest games for your Amstrad has been improved by the addition of some new screens and a whole new section.

After you've released all the sorcerers, in the old version, you put your feet up for a well earned rest; now, I'm afraid you go on to confront the necromancer himself.

Mcoder III

Spectrum 48K
PSS
Compiler
£12.95

★ ★ ★

A compiler of the old school. Good but not flashy. Copes with most Spectrum Basic, except Microdrive commands. It can cope with floating point arithmatic, produces fairly compact code, and speed increases in the order of 10 to 20 times depending on the sort of commands being used. If you don't need all the flashy extras of the Blast Compiler, or your pocket isn't that deep, this looks like a good second best.

High Rise Horror

BBC
Platform
Rabit Software
£3.99

★ ★

Nasty, brutish and noisy — would be a grossly unfair way of describing High Rise Horror. The game certainly has a crude addictive quality, but not much more.

Armed with only a balloon you must make your way from the bottom of the screen to the top, avoiding or destroying the assorted nasties which whizz mindlessly to and fro at high speed.

Then you can pass to the next stage where the landscape is the same but more crowded.

(continued from previous page)
France. But it has just as much potential appeal as its predecessor.

Spread over two days and two sides of a cassette, the events include pistol shooting, cycling, springboard diving, rowing, tug o' war, taking football penalties and two ski-ing events: the ski-jump and the giant slalom.

No time for the blade on the feather lark with the rowing section. Start pumping away to build up your speed shown at the bottom left of the screen. The display shows an overhead view of two kayaks zipping down the river. World records, i.e. hi-scores, are shown at the top right of the screen to encourage the spirit of competitive joystick destruction.

You stagger from you kayak to the football field — the display shows an overhead view of your footballer as he runs up to slam the leather into the back of the reticule. Your player runs as you either use the alternate left/right keys or pound away at the joystick to build up power for the shot. You control the ball's direction by timing the kick — the angle (or elevation) is controleld by the amount of time that the firebutton is depressed. You get five shots.

You won't find many footballer's ski-jumping, you may reflect as the pistol signals the gate to open. However, many of them are used to being on the slippery slope or for the high jump. Again continuous left/right movement builds up your momentum, but you must hit the joystick fire-button at the right moment as you come to the lip of the jump.

The tug o' war is impossible. You have a choice of 10 opponents, the weakest of which is totally invicible.

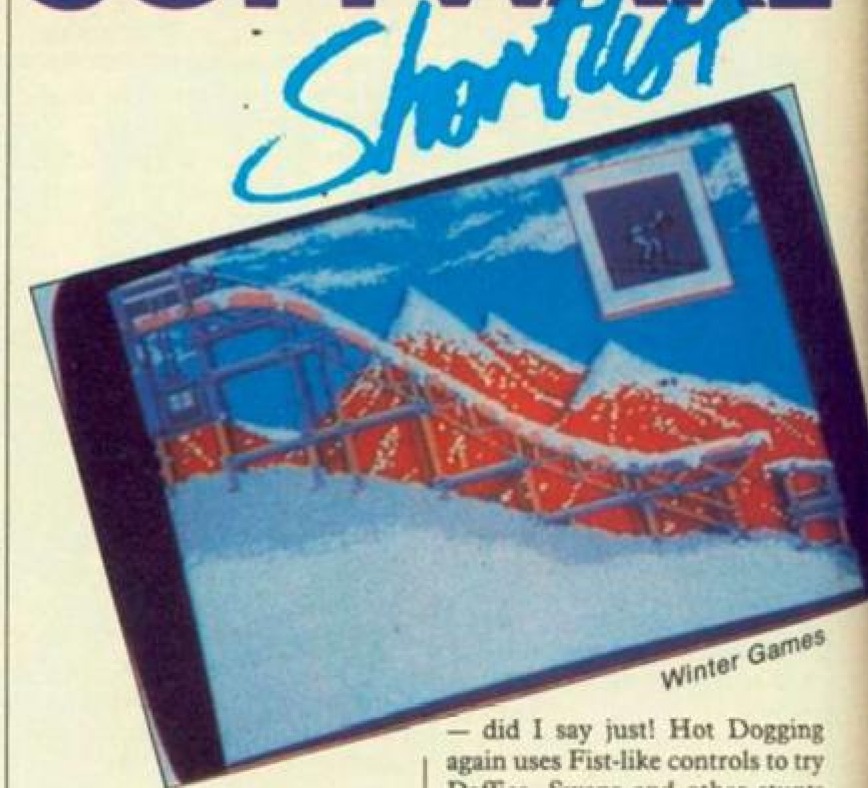
Paul Bond.





Daley Thompson's Super-Test — brings tears to your eyes.

SOFTWARE *Shortlist*



Winter Games

Winter Games

■ *CBM-64*
■ *Decathlon*
■ *US Gold/Expyx*
■ *£14.95*

★ ★ ★ ★

"BREAK OUT the silly hats" was the enthusiastic cry the moment Winter Games hit the office. Up to eight players can choose from 18 countries, and then under their borrowed flags and anthems battle through seven events. Although speed skating and biathlon use the time honoured decathlon — sorry heptathlon — skills of rythmic joystick waggling, the ski-jump and indoor skating are games in their own right.

The freestyle and figure skating look a little like Exploding Fist on Ice as different joystick movements allow you to carry out Camel and Sit Spins and Double and Triple Axel and Lutz jumps. "Figure" is used figuratively (*that's enough figures — Ed*) since you keep skating along the same direction for one or two minutes. With bush hat firmly on head Lynn "Call me Sheila" Dawson was moved to twang "She'll be out in the car park soon".

Toby put down his accordian, wiped the sweat off his brow with his beret and proceeded to win France's first ski-jump gold medal by a convincing display of balance and timing just beating Danneberg. of East Germany. Touch the jump button too soon and you just have to keep your balance in the air and land safely — did I say just! Hot Dogging again uses Fist-like controls to try Daffies, Swans and other stunts off a short ski-jump.

Winter Sports is great family fun — it should appeal to women more than most programs — and looks like being a winner this Christmas.

Meirion Jones.

Chop Suey

■ *English Software*
■ *Atari*
■ *£11.95*

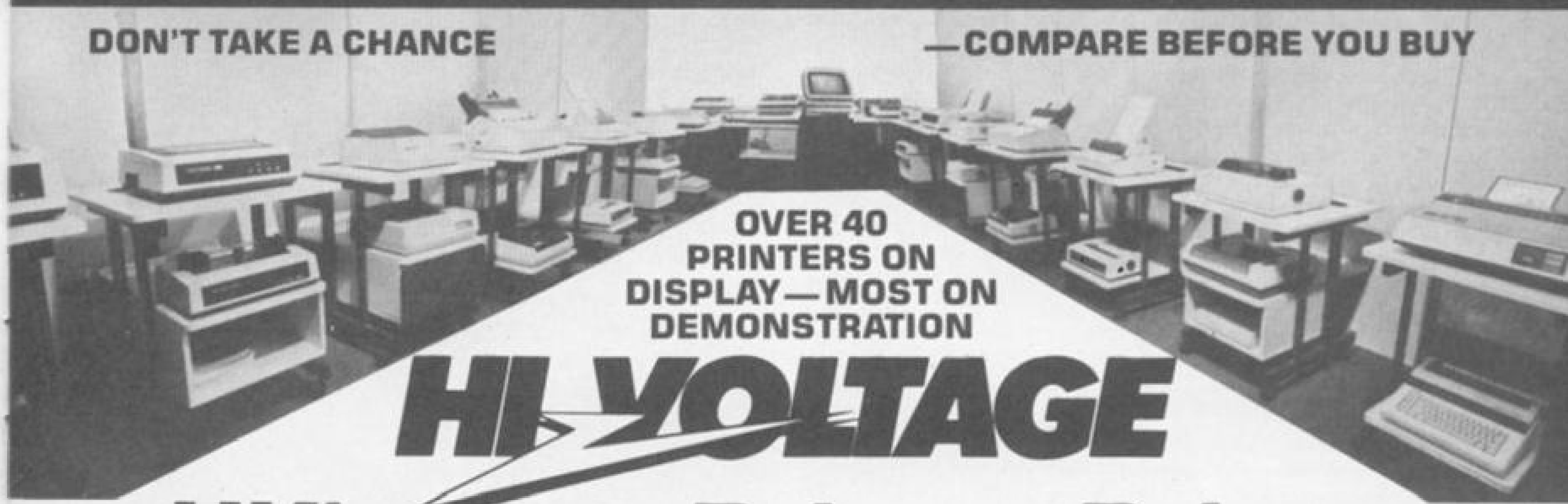
★ ★ ★

KUNG FU seems to be the recipe for success in computer games today, and Chop Suey is English Software's takeaway version for Atari owners. The introductory music is a bit of Bach (Brandenburg control) after which one or two players can get on with kicking each other's heads in.

The two figures appear on a three-dimensional stage, with a few rows of audience in the foreground. The animation is both detailed and colourful. You control your figure with a joystick, though as both figures are identical, it is hard to tell which you're controlling in the melee. The eight joystick positions provide an assortment of jabs, kicks and movements. Blows have to be on target to score. Two "pain-gauges" at the bottom provide a guide to your physical conditions (deteriorating).

The actual fighting seems to be pretty much the same as The Way of the Exploding Fist, so as King Fu games go, this is well done. However, it has few frills (scorpions to jump over; slow and fast modes) so it lacks variety.

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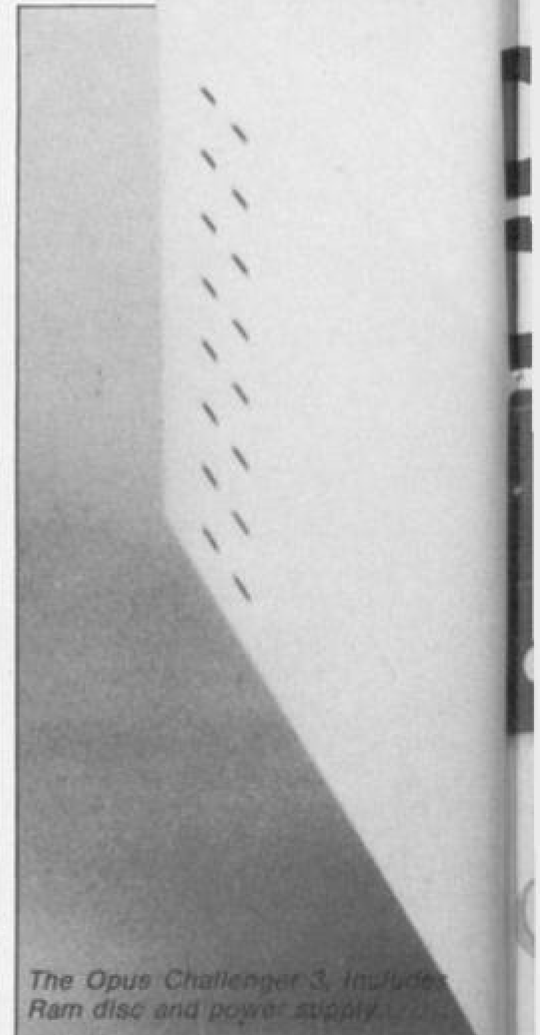
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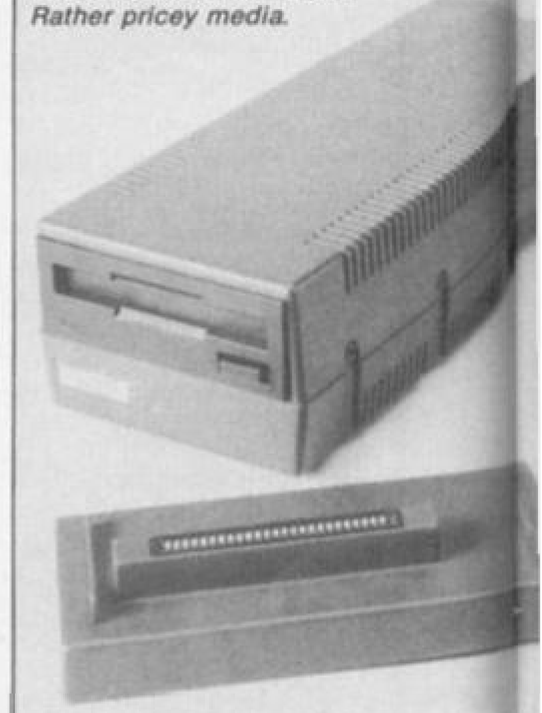
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Opus	Spectrum	£199.50	D	2	NL	✓	✓	—	✓	✓	✓	—	✓	none	Includes 3½ inch drive
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The Opus Challenger 3, Includes Ram disc and power supply.

The Amstrad 3 inch disc. Rather pricey media.



A YEAR AGO a disc drive for your micro might have been looked upon as an expensive luxury, but now, with the price of drives dropping all the time, they come within the price range of many people looking to get more out of their machine. So what are the benefits and possible pitfalls of disc systems, and how do you cope with the conflicting claims and jargon?

A disc is much more than a fast cassette recorder, because, like an audio record, you can get to any track instantly. This means that you can virtually use your drive as an extension of the computer's memory. So databases and spreadsheets are no longer limited to 30K or so work space within the computer. To use a cassette like this would be tedious in the extreme.

Even if you don't use such heavyweight programs, a disc drive is reliable, and discs less cumbersome to store, although disc based software can be expensive. Also, when developing your own software, you can rapidly back up each new version, and so speedily recover from a crash.



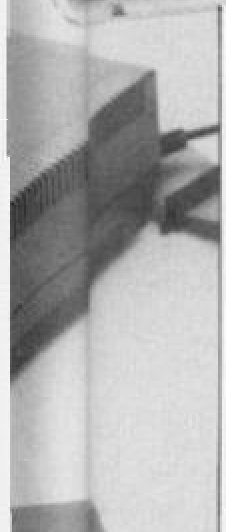
There are three components of any disc system. The drive, which is simply a mechanism which rotates the disc, moves a head across the disc, reads and writes data on the magnetic surface. Then there is the disc interface or controller, which makes the computer electronically compatible with the drive, and the operating system (DOS), the software which drives the interface.

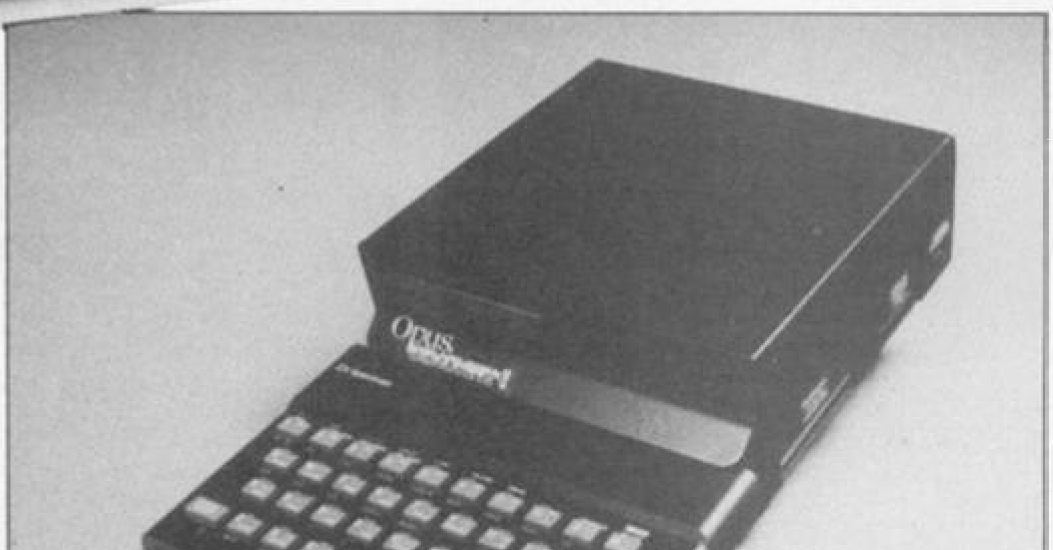
Disc drives come in a number of types and sizes. Most drives not specifically designed for one micro use a Shuggart bus. So you should ensure that any interface you buy conforms to this standard — almost all do. The drive mechanism will either consist of one or two

DISC DRIVE-IN



Buying a disc drive or interface? Lee Paddon puts you on the right tracks





Discovery 1 — an all-in-one solution for Spectrum owners.

read/write heads, ie either capable of reading only one or both sides of the disc at once. Whereas once 40 tracks per side was standard, the quality of disc mechanisms means that 80 tracks is fast becoming the norm. Better still are switchable drives so they can read and write to 40 or 80 track discs. Drives come in a variety of sizes. First came 8inch monsters, then 5¼inch, now 3inch and 3½inch are bidding to become the new standard.

Each have their advantages. 8inch is now obsolete, 5¼inch are cheap, reliable and readily available. 3inch discs are electrically identical to 5¼inch and can be substituted at will. 3inch discs come in a rigid packaging, and so will last longer, but are about three times the price of 5¼inch discs.

3½inch is a relatively new innovation, but since its adoption by Atari for its ST, it may become the front runner. It offers half as much space again as its main rivals, and is just as rugged but a good deal cheaper than 3inch.

Dual drives are a nice luxury, it allows you to protect yourself from disaster by regularly backing up your working disc to prevent a careless error ruining hours of work.

A final consideration is whether you get a built in power supply. If you have to rely on your micro for juice, it will seriously limit the number of drives or other gadgets you can add on.

The electrical interface and the operating system are usually purchased as a package. Although each has a clearly defined function, most disc operating systems are designed around the interface hardware. This is where the jargon jungle is at its most impenetrable, and what you get is largely determined by how much you are prepared to pay. So make sure you get the facilities you really need.

Certain terms crop up time and time again. Each track on a disc usually has 10 sectors each holding 256 bytes. So, if storage is a prime consideration, 80 track double sided double density is going to give you 400K storage per drive.

Single versus double density is probably the most important factor. Double density operating systems are quite expensive, but they do give you twice as much room on the disc.

They do this by leaving out synch bits on the disc, and to cope with this, error checking must be more rigorous. One word of caution, you should find out what the formatted capacity of your system will be, unscrupulous dealers might try to tell you the unformatted capacity of the drive which is of no practical value at all.

Random access files are a must for serious



business applications. In a random access file, you can dig out the particular piece of information you need from a particular file and update it without loading and saving the whole file taking up precious time and memory. It is a sad fact that not many budget operating systems offer this facility.

It can, however, be fudged if a system supports serial access files where records can be read in order, and a new file created with the updated record — a poor second best.

Speed is not perhaps the most important consideration in a disc system, since most systems, with the glaring exception of the Commodore 1541 system are fast enough. However, hope is at hand, a new drive, the 1572 is promised. Speed is a function of both the speed of the drive and the efficiency of the DOS software. Whether this is important to you will depend on what you want a disc drive for. Try running two opposing systems side by side, ideally running the program you intend using most.

Operating system compatibility is another term often banded around. The Amstrad DD1 claims to be CP/M compatible, but will only run cut down versions of the standard packages. It claims to use IBM format files, but the IBM PC usually runs under a different operating system: MSDOS. Speaking of which, the new Enterprise disc system claims to run MSDOS and read IBM files, but this is rather pointless when the computer uses a Z-80 processor rather than the 8080 chip needed.

So treat all claims for "compatibility" with a good deal of caution. Another aspect of the

(continued on next page)

DISC DRIVE SUPPLIERS

Akhter, 28/29 Burnt Mill, Harlow, Essex CM20 2HU. Tel 0279 443521. Full range of 5¼ drives.
Advanced Memory Systems, Green Lane, Appleton, Warrington WA4 5NG Tel 0925 62907. 3 inch drives.
Chase Data, Unit 2, Crabtree Road, Thorpe Industrial Estate, Egham, Surrey TW20 8RN. Tel 0784 38487. Double Sided 5¼ inch drives.
C Tech Computers, 184 Market Street, Hyde, Cheshire SK14 1EX. Tel 061 366 7794. Double Sided 5¼ inch drives.
Cumana, Pines Trading Estate, Broad Street, Guildford, Surrey GU3 3BH. Tel 0483 503121. Full range of 5¼ and 3½ inch drives.
GCC, 66 High Street, Sawston, Cambridge CB2 4BG. Tel 0223 835330 some 5¼ double sided and 3 inch drives.
Keyaki, 44 Terrace Road, Walton-upon-Thames, Surrey. KT12 2SD 3½ inch drives.
Midwich, Gilray Road, Diss, Norfolk, IP22, 3EU Tel 0379 4131. Twin, double sided 5¼ inch drives.
Opus, 55 Ormside Way, Holmthorpe Industrial Estate, Redhill, Surrey. Tel 0737 65080. Full range of 3 and 5¼ inch drives.
Pace, 92 New Cross Street, Bradford BD5 8BS. Tel 0274 488211. Full range of 5¼ inch drives.
Solidisk, 17 Sweyne Avenue, Southend-on-Sea, Essex SS2 6JQ. Tel 0702 354674. Some 80 track 5¼ inch drives.
Technomatic, 17 Burnley Road, London NW10 1ED. Tel 01-208 1177. Some 5¼ inch drives.
Twilstar, 17 Regina Road, Southall, Middx UB2 5PL. Tel 01-574 5271. Full range of 5¼ inch drives.
Vigelin, Unit 7, Trumpers Way, Hanwell W7 2QA. Tel 01-843 9903. Full range of 5¼ inch drives.
Watford Electronics, 250 High Street, Watford. Tel 0923 40588. Full range of 5¼ inch drives.

DISC INTERFACE SUPPLIERS

Micro Peripherals, Intec Building 2, Units 2-3&4, Hassocks Wood, Wade Road, Basingstoke, Hants RG24 0NE. Tel 0256 473232.
Kempston Microelectronics, Singer Way, Woburn Road Industrial Estate, Kempston, Bedford NK42 7AW. Tel 0234 856633.
Technology Research Ltd. (Beta), Unit 18, Central Trading Estate, Staines, Middx TW18 4XE. Tel Staines 63547.
Medic Data Systems, Hackwood Lane, Cliddesden, Basingstoke, Hants RG25 2NH. Tel 0256 460748.
Gordon Micro Ltd, 3 Callender Road, Heathfield Industrial Estate, Ayr KA8 9DJ. Tel 0292 280467.
Watford Electronics, 250 High Street, Watford, Herts WD1 2AN. Tel 0923 37774/40588.
Acorn — Any Acorn dealer.
Enterprise Computers Ltd, 31-37 Hoxton Street, London N1 6NJ. Tel 01-739 4282.
Dudley Langmead Enterprises, (Oric), 93 Bedford Road, Hitchin, Herts SG5 2UA. Tel 0462 31225. Available from end of October.



Cumana's 3½ inch drives, the up-and-coming standard.

(continued from previous page)

same problem is that if you buy a DOS from a third party, it must be compatible with the standard operating system of the micro manufacturer.

Thus any proper disc system for the QL for instance must be compatible with microdrive commands or you won't be able to use the new drive to run the bundled software. Next on your list of questions should be how much of your micro's precious Ram is taken up by the disc DOS and does the DOS support a ram disc.

Pinches over 2K of Ram

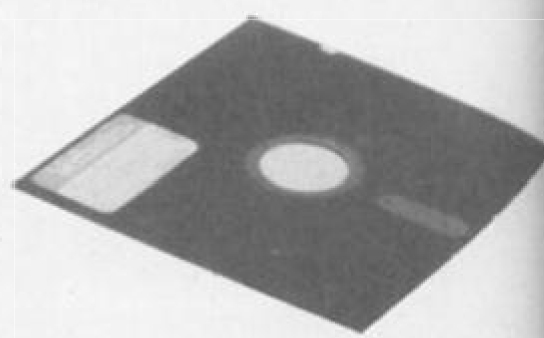
The Acorn DFS for the BBC micro pinches over 2K of Ram from the machine's already inadequate supply. Many Spectrum owners encounter problems with their interface 1's due to yanking them out every time they want to load up their favourite games, and a similar problem occurs to Amstrad owners.

A Ram disc is a data structure which sets aside an area of Ram which, in the eyes of the DOS, looks like a disc, with a directory and files, but with far quicker access times. A new idea is to incorporate Ram into the drive itself as in the new Challenger 3 from Opus, an idea which should become increasingly popular as memory prices continue to plummet.

Next we come to what is perhaps the guts of an DOS: the commands it offers, and their format. A bad example of syntax is the Sinclair system for interface 1. This is mainly due to the fact that you have to specify everything in an inflexible syntax, a good DOS will assume certain default values if the user fails to specify them. It should also be possible to specify files by "Wildcards". A file name normally has two parts, a name and an extension, wildcards allow a disc command to apply to all files with a certain name or extension, or those which start with a particular string.

Most disc systems can list the files on a disc, but ideally they should give more information than this. File size, type, and execution address are all helpful, although in some DOS, this information is provided by "help" or "info" commands. Obviously it must be possible to save blocks of memory, machine code, programs, arrays, and variables as well as Basic.

Another point to watch is some systems limit the number of files you can have per side of the disc. If you intend using a lot of short files, this is obviously going to mean a lot of fumbling around with discs. Rename might seem a rather trivial command, but is vital if random access is not supported. This means that after an updated version of an old file has been created, the old file is erased and the new file renamed



so that when the file next needs to be updated, the name will be the same. Compact tells the DOS to tidy up a disc.

After a time, gaps appear in a disc where programs have been deleted, this can decrease the amount of space available, compact crushes all the files up, freeing more space. Merge allows a large datafile to be created out of two smaller ones, with either one file in Ram, and the other on disc, or both programs on disc.

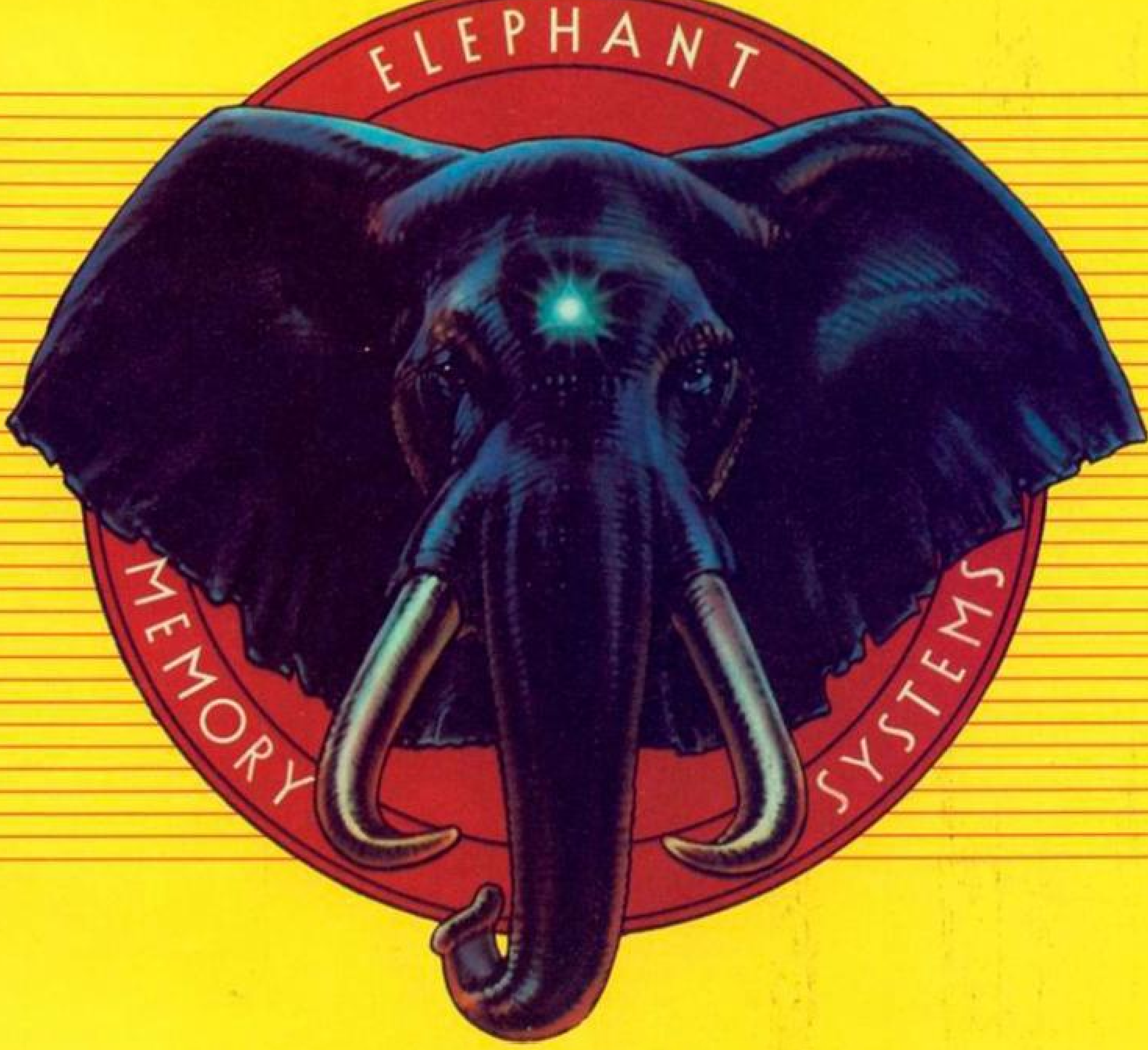
Make sure you shop around

It is obviously impossible to make any definitive recommendations about which system to go for, much depends on what you want and how much you are prepared to pay for it. The main thing is to shop around and make sure the system you go for in the end can actually deliver everything it promises. Apart from the actual purchase of a micro itself, the choice of a disc system is one of the most fraught decisions you can make, and mistakes can be costly.



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SPECTRUM

WHAT DO YOU GET if you cross a mouse with a telephone?

Good taste, the Animal Liberation Front, and the Official Secrets Act prevent me from telling you what I have seen in the Government's genetic engineering laboratories. All I can say is that Sinclair has come close with the weird numeric keypad which is the Spectrum 128's most distinctive feature.

A white 128 badge and an external aluminium heatsink — that looks like it might be a constructivist memorial to all those who perished in the computer wars — are the only other signs that this is a Spectrum Plus Plus. The 128 goes on sale in Spain now, four months before it hits these shores, but if you are thinking of popping over to the Costa Investronica to bring back a new Sinclair and an autumn tan don't bother.

Devil worship

If you wait till the U.K. launch next spring the 128 will cost around £150 whereas a Spanish Sinclair will set you back £100 more, including tax but not including a dictionary to translate error messages such as "Entero fuera de rango". So why is Sir Clive making good old blighty play second fiddle (or maybe that should be Fidel, since Investronica plans to export to Latin America) to Spain?

In short this summer's financial problems have forced Sinclair to sell his soul to the Devil, or rather Dixons. They agreed to take the mountainous drifts of surplus QLs and Spectrum Pluses off his hands if he agreed not to launch any new products here, which might damage their sales, until well after Christmas. But Sir Clive still desperately needed to show he had new products on the way. Hence the Spanish 128 deal.

A close inspection of the 128 shows that the Plus keyboard has survived intact apart from a few cosmetic changes made to satisfy new Spanish government standardisation regulations — the word video in black out of white to show true video and reversed on the inverse video key for instance. the Mic and Ear sockets have been moved from the back of the Plus to the left hand side next to a new RS-232 port to take the interfacing out of connecting up a printer, or modem to your Sinclair.

The RS-232 claims to double up as a MIDI music connector. But then what's in a name? Everyone knows that Sinclair is a corruption of St Clare — the patron saint of televisions — but no-one takes seriously Sir Flat Screen Clive's claim to be a major producer of bent tellies.

The whole point of MIDI is supposed to be a single standard to make interfacing music machines and micros easy so you can control instruments from the computer, modify pices of music and interpret them on screen. So the 128's non standard MIDI connector will have to be carefully examined on a full production machine before it can be recommended to musicians.

At the back the expansion slot is still where it was and all peripherals are still compatible except perhaps those that initialise system variables. An RGB/composite video port has now taken the place of the Mic and Ear sockets. Because the 128 incorporates an AY-38910 sound chip like the Amstrad et al the internal loudspeaker that was happy enough beeping and purring its way through the death march which every other Spectrum game features, shows its shortcomings. Now like other micros a new modulator feeds the TV socket sound as well as vision. At last turning up the noise is a simple matter of sliding up the TV volume button.

Search as you may you still will not find a joystick port on the 128 — an unforgivable omission — although some software houses will doubtless use the 128's numeric keypad as a touch pad controller.

This numeric keypad is a strange looking creature, like a calculator attached to the front of the computer by a curly telephone cable. If it had a track ball in the base to allow you to spin a pointer around on screen you would call it a mouse — but it doesn't so we'll call it a hamster. You can use this 15 button rodent as a simple calculator which displays the answers on the screen or for entering numeric data into programs — it might make typing in *Your Computer* listings a little less tiresome-or in 128 mode as a full screen editor. At last you can edit programs at will including renumbering sending the cursor straight to the area that needs correction.

When you turn on the machine it defaults to 128 mode with a white or blue cursor instead of all the "Ks" and "Es" of the original. If you enter the command Spectrum it changes to 48K mode without losing the contents of memory but the only way to make it revert once again to 128 is by resetting — losing everything.

Basic programs can transfer from one mode to the other easily. If you Peek 80000 in 128 mode you will still get an out of range message because the additional 64K of memory is only accessible from machine code. The 32K Rom includes the old 16K Spectrum as well as the separate 128 operating system. The extra 64K Ram is paged in 16K blocks.

Memory maps are already in the hands of those software houses that have not had prototypes. Ocean is already demonstrating a 128 version of Match Day which takes advantage of the improved sound with cheering crowds, referee's whistle and so on. Supertest 128 is also near completion as well as the load-in-one version of the three part NeverEnding story

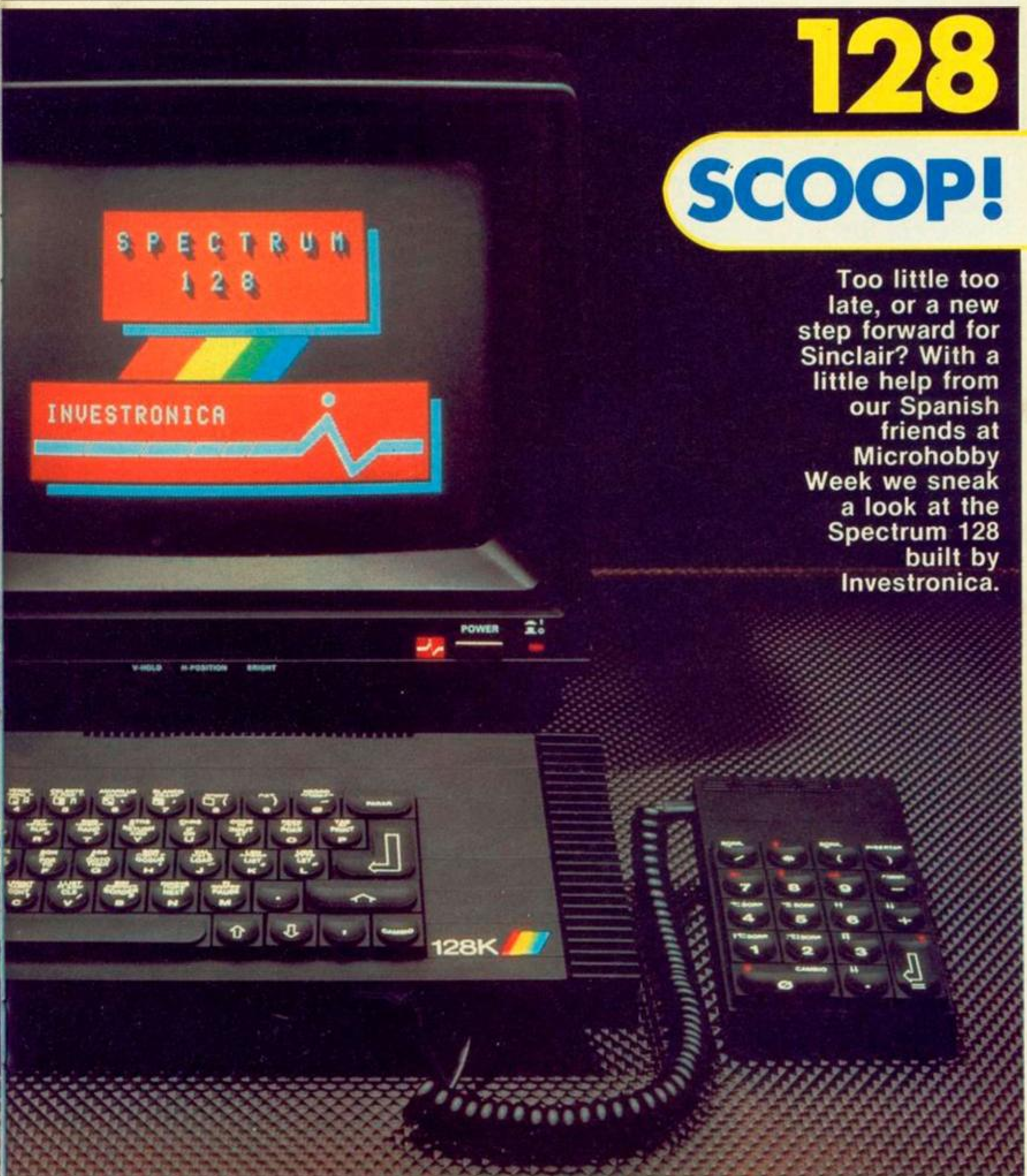


128 COMPARISONS

- ☐Commodore 128. Better graphics, sound, software. £275.
- ☐Amstrad 6128. Includes CP/M, monitor and disc. Less games. £300.
- ☐Enterprise 128. Includes word processor, joystick. Almost no software. £250.
- ☐Atari 130XE. Brilliant games but not as many as for Spectrum. Still tops for sound and vision. £170.

128 SCOOP!

Too little too late, or a new step forward for Sinclair? With a little help from our Spanish friends at Microhobby Week we sneak a look at the Spectrum 128 built by Investronica.



epic. Ocean's David Collier says he has had no loading problems with the Sinclair 128 unlike the Commodore 128 which has a variant of the 6502 processor "which is not as robust" as that in the 64. Ocean has now rewritten its fast loader to avoid crashing the Commodore 128.

The Sinclair 128 has the same ULA as the Plus so resolution, colours and screen management are all the same — 256 × 192, 8 colours. A Play command gives access to the new sound facilities. Text can be stored as separate pages by storing in the form of variables — A$, B$ and so on.

Spring offensive

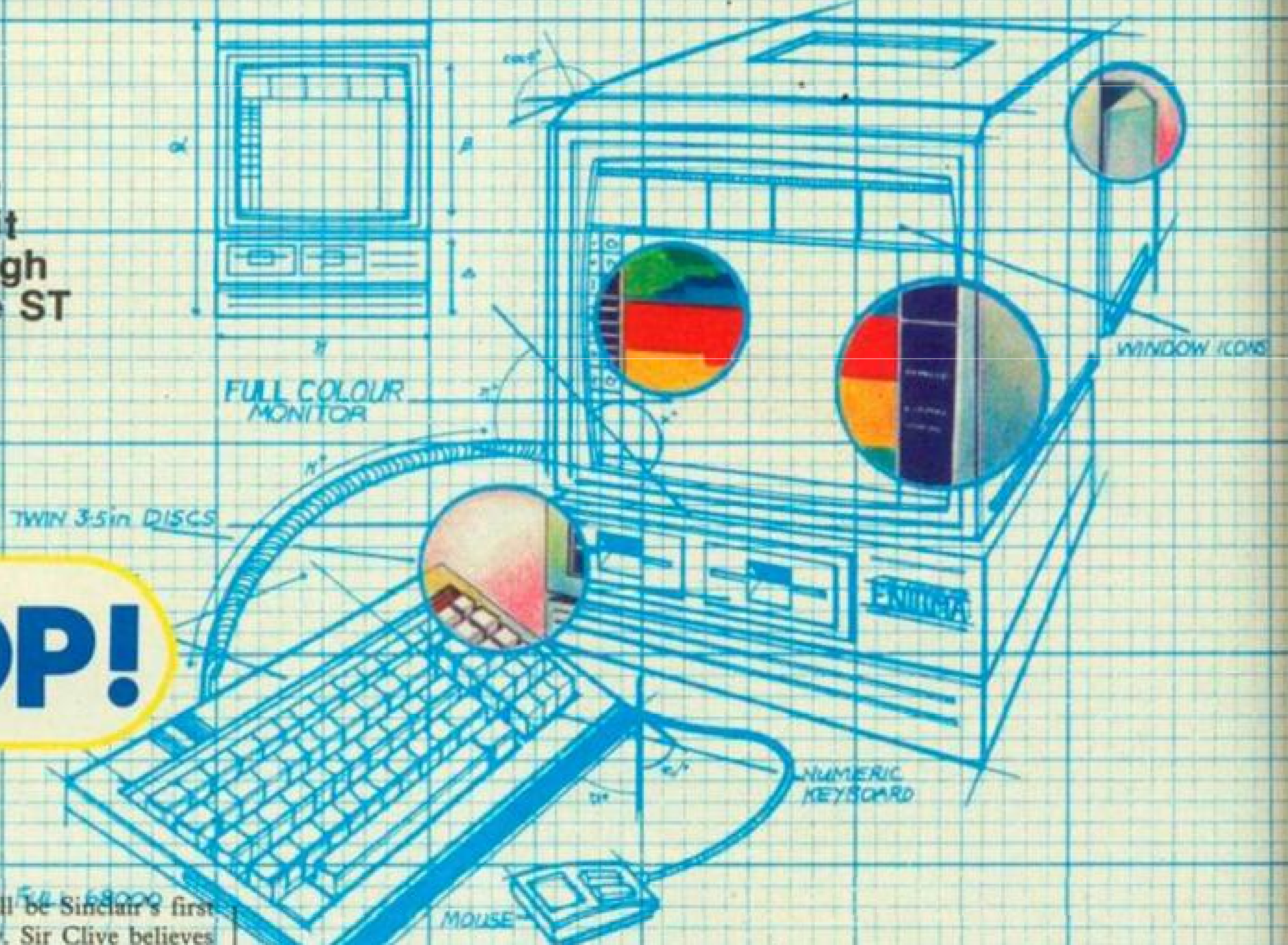
Of course the machine we have seen is still a prototype, one which Domingo Gomez of Microhobby-Weekly magazine in Spain could only inspect at the headquarters of Investronica in Madrid but this is not a one-off special aimed only at Spain.

There may be some changes before it appears on the British market next spring but despite its faults the 128 looks like it will be a strong base model for Sinclair's new 1986 model range which will include the portable Pandora and the desk-top Enigma (see over page).

SINCLAIR ENIGMA

Next year's model from Sinclair is the Enigma. Can it be good enough to take on the ST and Amiga on their own ground?

SCOOP!



NEXT YEAR'S Enigma will be Sinclair's first Mega-machine — literally. Sir Clive believes that 1024K of Ram, one Megabyte, is the minimum needed to compete with the likes of Atari's ST and Commodore's Amiga.

He has also bowed to the inevitable and abandoned the Microdrives for a pair of built-in 3.5 inch disc drives. But the portable Spectrum-based Pandora also planned for early next year will still use Microdrives to keep down costs and weight. If Sinclair goes ahead with a portable QL that too may stay with the stringy floppies.

The Enigma is planned for launch in May '86 somewhere in the vague £500 — £1,000 price band. It will have a version of the Psion Quill, Abacus, Archive and Easel suite of programs but on Rom rather than the QL's Microdrive cartridges. The Enigma will also have a full Window, Icon, Mouse environment, probably Gem as used on the Apricot, since Digital Research has been having talks with Sinclair for some time and has publicly claimed that Gem could be ported straight across to the QL. The big question is whether Sinclair can compete with the Supermicros without going for a full 16-bit Motorola 68000 like the Amiga, Macintosh and ST rather than the cut-down 68008 in the QL.

The Enigma will be sold as a complete package; computer, software, two drives, mouse, colour monitor and printer. It might also develop with the addition of a phone and communications into a colour replacement for the Sinclair developed monochrome ICL One Per Desk — which because it was only black and white was known during its development as "Work Station Zebra".

Sinclair is also working on a "personal communicator" a £99 cigarette packet-sized portable phone that would allow you to make and take calls on the already established cellular radio network at any time or place. With the 128, Pandora and Enigma all lined up for launch in the first half of next year there would seem to be no place for the much-rumoured QL 2 as such. This now seems to have grown into the Enigma.

Sinclair's plans look ambitious at a time when the company is making 20 of its 120 staff redundant and such senior personnel as Nigel Searle and Robb Wilmot are being kicked off the Sinclair board. The company is also losing its bottle — or at least its converted bottle factory headquarters at Willis Road — where development work on new computers used to be concentrated and moving the entire operation to Milton Hall, country mansion of of Sinclair's Metalab.

Nigel Searle had been head of Sinclair's computer side before he was sent on a none too successful trip to America to boost Sinclair sales over there. Searle now loses his position on the board but stays on as Sinclair's top dog in the States. Robb Wilmot, Mr ICL, long-time associate of Sir Clive was brought in six months ago to develop the Sinclair/Catt wafer scale technology which promised to produce failsafe single-chip mega computers by the 1990's. Now Wilmot leaves the board and the company.

Can Sinclair's Enigma be ST, Amiga beater?



ADVENTURE INTERN

HOME OF THE HEROES

Paul Bond goes in search of adventure.

FINDING THE headquarters of Adventure International UK is a bit like solving an adventure in itself. The clue is the company sticker in the window of an otherwise nondescript warehouse in Birmingham 19.

"We don't mind being hard to find", says Mike Woodroffe, managing director and general co-ordinator of programmers and projects. "We're happy to talk on the phone, but we couldn't do with hordes of crazed adventure fanatics hanging about outside".

Life in the Handsworth area has been exciting enough without that: "Most of the rioting was only a mile away from the unit, but it affects the locals less than it affects people reading the national newspapers".

Seas of Blood, AI's next release, has nothing to do with urban unrest, but plunges us into a life on the ocean wave. Based on one of the Fighting Fantasy series of books by Steve Jackson and Ian Livingstone and published by Puffin, the game puts you in charge of a pirate ship. Together with your band of seasoned cut-throats you must scourge the Inland Sea, searching for gold and slaves and defeat your rival Abdul the Butcher in the race to become King of the Pirates. Setting off from Tak, the greatest den of thieves the world has ever known outside of a computer fair, you journey through 180 locations at sea and 83 ports — all with graphic illustration. There is a mini-adventure at every stop with 20 treasures to find all defended by gruesome monsters.

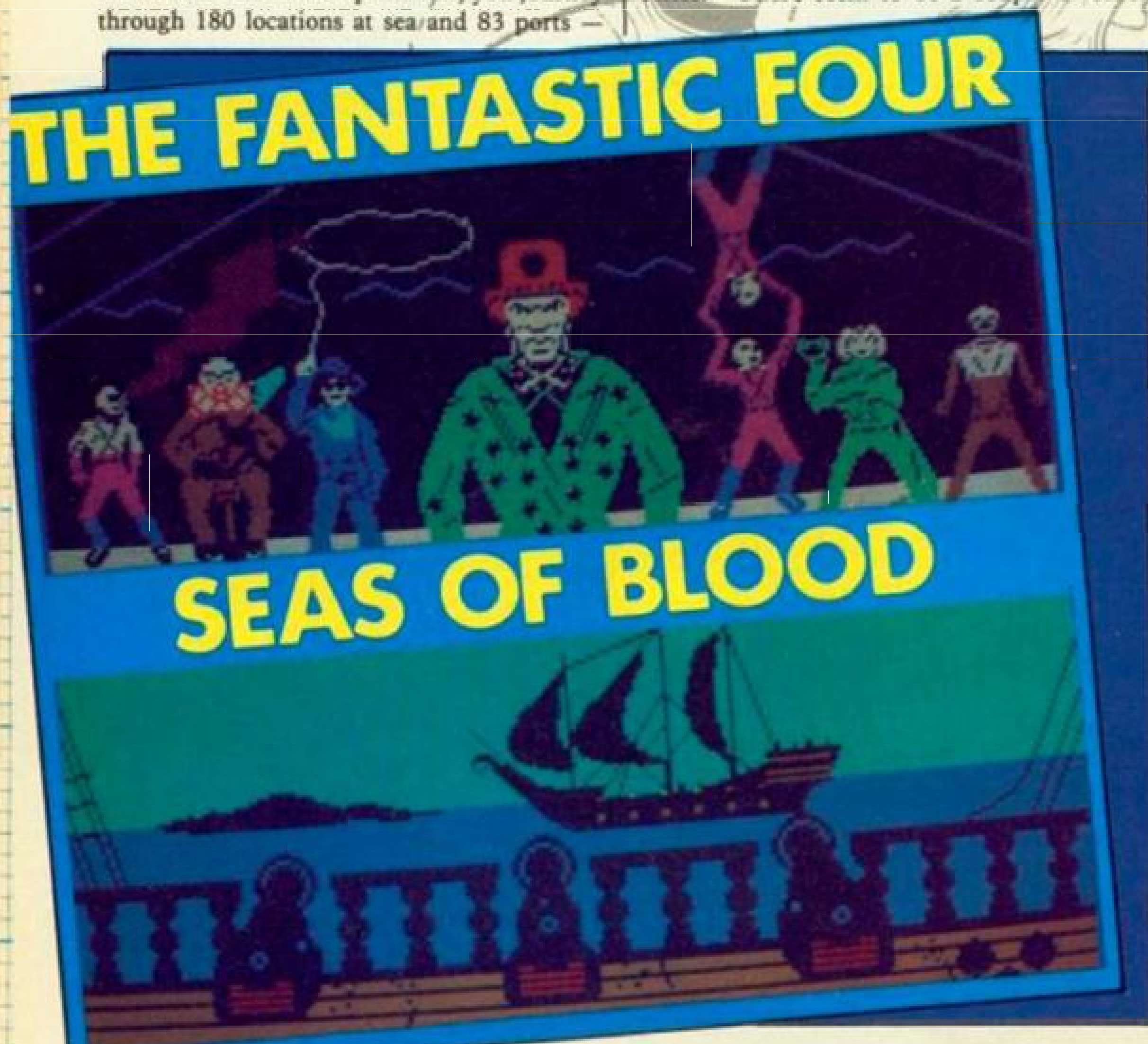
"We've taken the basic scenario of the book, changed some of the puzzles and objectives. The book and the game are different, but we've kept the scoring and stamina system. For instance, you don't just Fight Galley — you work out relative strengths to decide the outcome". Other FF games are planned — the next release looks like being Appointment with F.E.A.R. "The Fighting Fantasy books have sold over eight million copies — that's a lot of potential buyers".

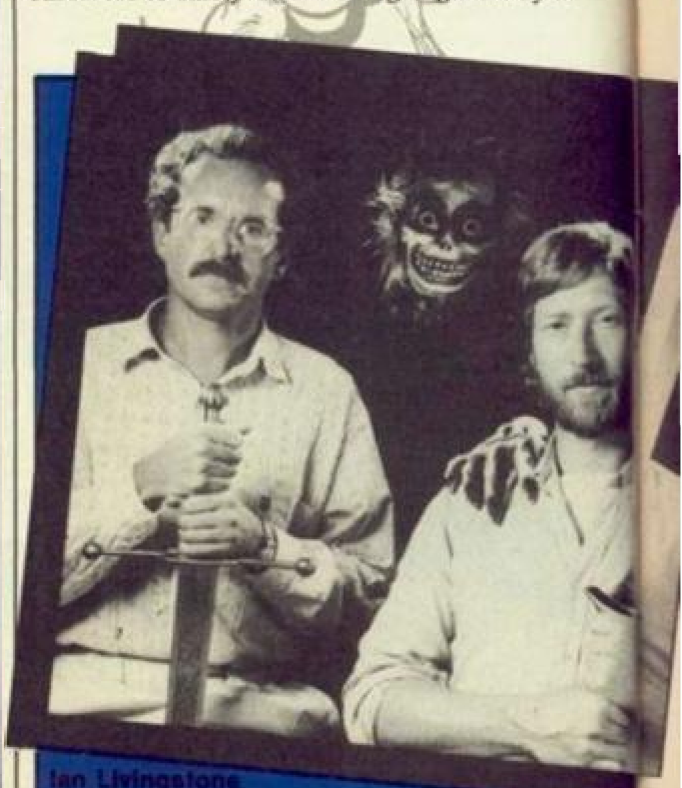
A land-based outlaw is the subject of AI's Robin of Sherwood series of adventures, notable for their excellent graphics (see Quest Corner, this issue). Touchstones of Rhiannon's sequel, Seven Swords of Wayland, features the Hounds of Lucifer — sounds like Mike Woodroffe would like to unleash them on some nefarious characters in the industry; while the Robin Hood games are officially licensed and based on the books of Richard Carpenter, like the TV series. "There seem to be a couple of other



Robin games about. We've sent copies of the ads to the licensing company. It's up to them — otherwise there's no point in our paying the licensing fee in the first place".

Adventure International also plans an assault on the arcade adventure market. Davy Jones' Locker is a joystick-based arcade adventure featuring Pegleg Bob, the lighthouse keeper. He must row to the lighthouse to rescue survivors of a shipwreck. In this sequence he is attacked by a whale, a swordfish and a shark which he has to beat off with his oars. Seagulls also fly about dropping unmentionable things on him. Next he runs across the rocks as the sea rises and waterspouts erupt around him. Now he must find the survivors and put them in a cave, while under attack from crabs. The final sequence is the wreck itself. He must row survivors to safety before being engulfed by a





Ian Livingstone and Steve Jackson.

NATIONAL

tidal wave.

This is a long way from American Adventure International's founding father's original vision. Does Scott Adams, the man who originally crammed Crowther and Woods' Colossal Adventure into a TRS-80, let the UK operation have a free hand?

"We're totally different companies, both from the ownership and the financial point of view. We have the licence for Scott Adams' product in the UK and Europe — at the time we got it Tricia (Mrs Woodroffe) and I were importing American software for the Atari 400/800. We did more business with Scott than anyone else."

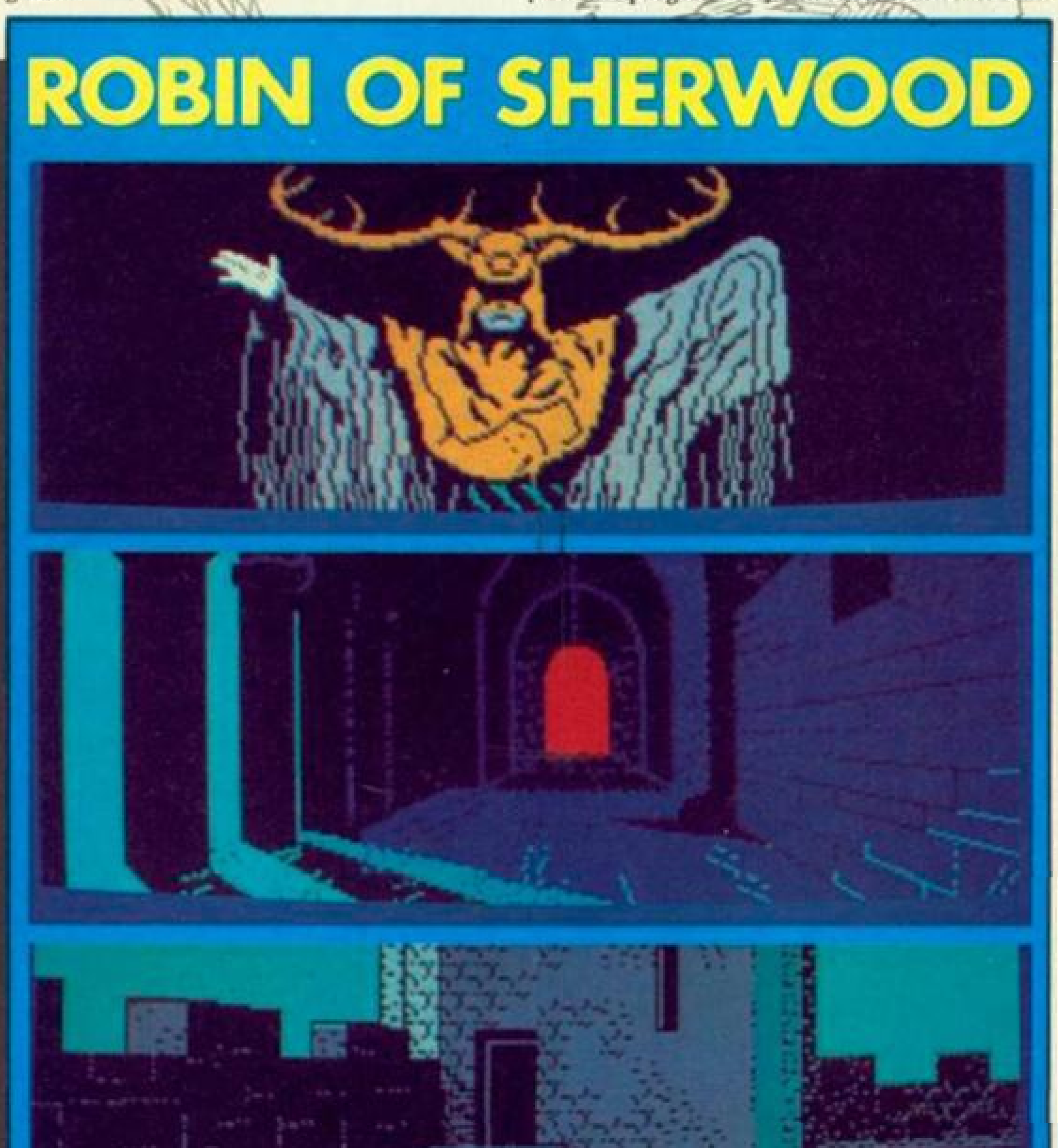


Nigel Bamford, Michael Woodroffe and Patricia Woodroffe.

It struck Mike Woodroffe that the American packaging was unnecessarily large: "We were paying to fly blocks of polystyrene over the Atlantic. Scott suggested that we set up our own duplication operation here — so Adventure International UK was born. We went over to Florida, spent the week in Disneyland — it was great".

AI-UK also plan an arcade-style Gremlins game (not to mention a second Gremlins adventure proper). More Gremlins? Is this wise?

"Well, the first Gremlins by Brian Howarth, our ace programmer, outsold all our other stuff by double. It's been translated into Spanish and German with great success, and there's a French version on the way. A new Gremlin movie is due for release at the end of 1986."



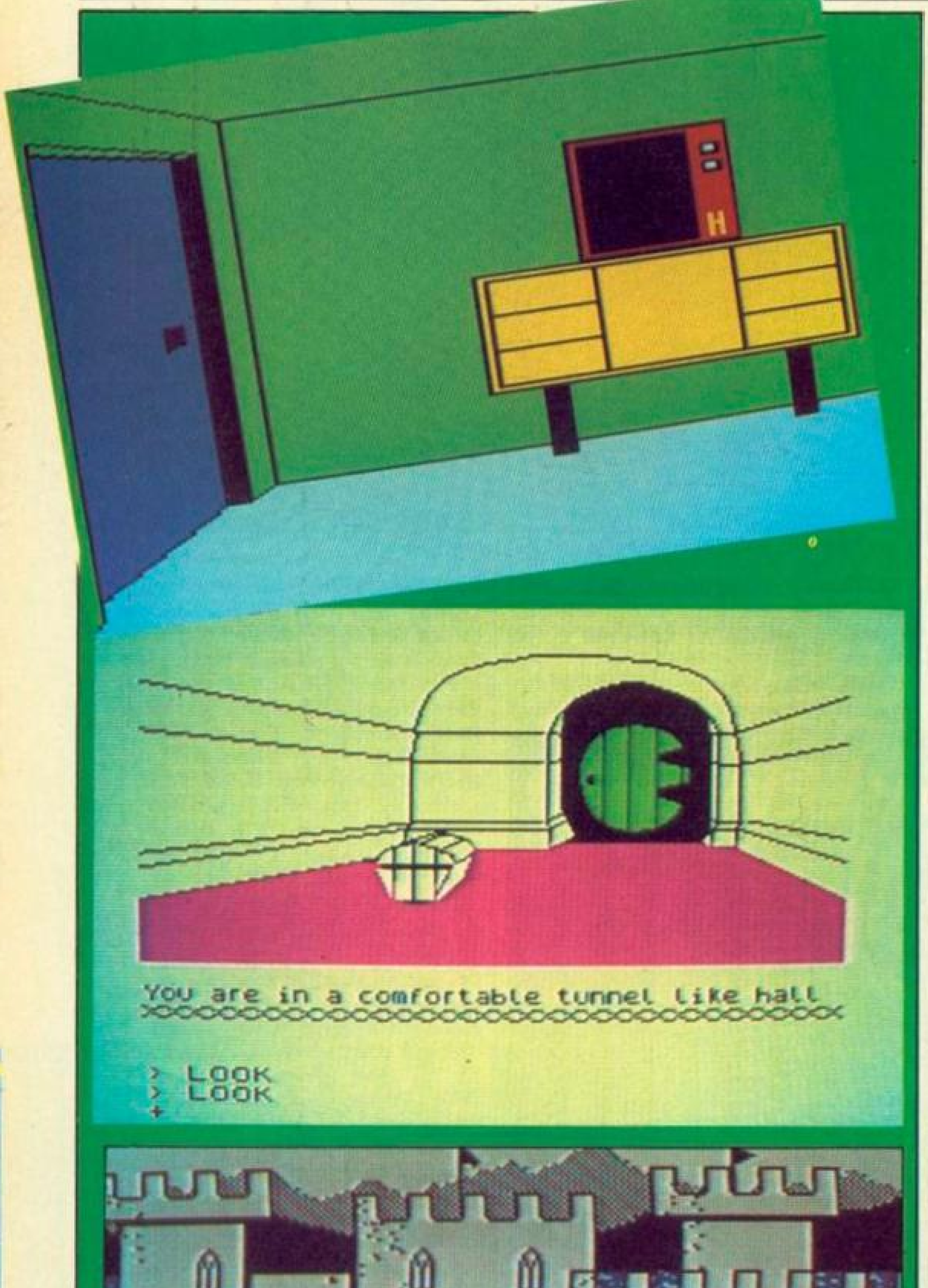
The company implements American products like the forthcoming Quest Probe III game, featuring the Fantastic Four in the following way. Scott Adams writes the main story and Marvel comics in New York draw up the artwork. This is then sent to Ken McNair in Florida who codes it all onto an Apple. "Then we take the plot and the disc and convert it to Spectrum, Commodore and so on".

The Fantastic Four game stars the Thing and the Human Torch. It has a revolutionary new method of play for a Scott Adams game. You can switch indentities and there are far more Marvel characters featured than in recent games. "The US market is disc-based. Sometimes our cassette versions appear before they get the game over there". Anomalies are common in the adventure market. Adventurers buy strange things and the games can sit on the shelf for a long time. This puts off wholesalers.

"Would you believe, one chain store wouldn't take Robin of Sherwood — it has some of the best graphics I've seen in any computer game, not to mention publicity from the books and the TV series", says Woodroffe. The new series will star Sean Connery's son incidentally. "Only Centresoft carries our whole range."

To solve this, AI created the concept of the Scott Adams Adventure Centre — basically dealers don't need to pay for units until after they've sold them. "We haven't pursued the concept very energetically — there are about 15 Adventure Centres at the moment — we plan on 80 or 100, but we'll get down to that after Christmas". One thing is sure, AI have plenty of new releases planned — apart from Fighting Fantasy, Robin of Sherwood, Gremlins and Quest Probe, they have the rights to Buckaroo Banzai *(who is he ? — Ed).*

Take Indiana Jones, mix a little popstar, throw in some super-hero and space-ace and you've got a Twentieth Century Fox movie awaiting release. "They've actually got the film in stock over here, but it's not being released yet". Could be another first for Adventure International. You've played the game, now see the movie.



Top: Hewson Consultants' Fantasia Diamond is a typical 'post-Hobbit' program featuring a number of interactive characters, some of whom — the Toy Robot in particular — assume quite significant roles in the game. Middle: The Hobbit was one of the first popular games to feature true 'interactive characters'. Bottom: Valhalla was notable for its interactive characters, one important function of which was their ability to 'remember'.

INTER ADVENT

PROGRAMMING TEXT-ONLY adventures in Basic is really quite easy, and lots of people tend to have a bash at it at some time during their programming careers. The funny thing is, though, that although an adventure is meant to be a program that interacts with the player, there's one feature that's almost always missing from a Basic adventure game — and that's interactive characters.

An interactive character is someone like Thorin in the Hobbit — a computer-controlled personality who appears to have a mind of his own. You may even, if he or she has been well-programmed, be able to sit down at the keyboard and have a limited conversation together. This particular feature can add enormously to any adventure game, be it of the simple home-brewed Basic variety, or a fully-fledged commercial game. Unfortunately, it's often either badly implemented or left out altogether.

The reasons why so few games have good characters in them may seem obvious. If you're going to include other people in the game, you're also going to have to include a whole load more data for messages — either speeches for them to deliver, or descriptions to tell the player what they're up to. On top of that, you'll also need to test hundreds of conditions to determine when these messages should be output. Obviously all this is going to take up loads of Ram, which you probably can't spare, because adventures tend to take up loads of Ram anyway.

Well, the good news is that there are ways of programming "intelligent characters" into your Basic adventure games, and these methods don't necessarily take up much space. You'll still need to set aside data storage areas for messages, but you can fit an awful lot of messages into, say, 3K — and that still leaves you with lots of room for other things like location descriptions and so on.

In this, and the two issues of *Your Computer* that follow, we're going to let you in on the secret of how it's done, and leave you with a type-in listing that will have characters interacting away to their hearts' content, or until you press the Escape key.

First, for those who may be a little unclear about the subject, let's define exactly what an interactive character is — and what it isn't. An interactive character should have three main attributes: the ability to move from location to location without help from the player; the ability to get, carry, and drop objects; awareness of his/her surroundings. These three main attributes will enable the character to play a significant role in the game. We've already mentioned Thorin as an example of such a character — another example would be one of the characters in Valhalla.

RACTIVE
TURE CHARACTERS

MAKE IT LIVE

James Hartley meets interesting people.

Some games do, of course, include characters but include them in such a way as not to qualify for the term "interactive". Such characters are really just objects, which are described in human terms. They can still be quite effective, but the point is that such "pseudo-characters" are 100 percent predictable. Once you've met "the old man by the crossroads", you know that you'll meet him again at the same point in the game every time you play.

If, however, the old man was a real interactive character, you might meet him in the pub, on the street, at the hotel, or even catch him stealing up behind you and pinching your purse — whereupon you can chase him and try and get it back.

All these actions can, in an adventure program, be set in motion by a routine which from now on we shall call the character handler. This is a routine that can accept the data for any character in the game, process it, decide what action (if any) to take — such as moving the character — and then return to the main adventure program. There are two sorts of character handler — asynchronous and synchronous. All this means that in the first case the routine is called independently of the player's actions.

In other words, whatever may be going on in the main program, a call is suddenly made to the character handler to update all the characters. Both the Hobbit and Valhalla use this technique — if you sit back and do nothing, you'll see the characters continue to act out their own pre-programmed lives, with perhaps a message such as "You wait ..." or "Time passes ..." flashing up on the screen every few seconds. This system is rather difficult to implement in Basic, unless you have an MSX or Amstrad computer provided with Basic interrupt commands.

An asynchronous system can appear more lifelike, because the pace of the game doesn't depend on the player, but a synchronous system is easier to program. Using this system, the character handler is called regularly at a certain point in the program — usually when the player enters a command. This is the system we shall be using here.

Before we actually get down to the nitty-gritty of bringing our characters to life, there are just two more possible attributes for characters that need to be mentioned. The first is speech — they should ideally be capable of addressing the player without being prompted, and — even better — answer back if spoken to.

The second is "history" — which means that a character should have some idea not just of what is going on around him/her, but also of what has happened previously. The best example of this is Valhalla, where characters like Thor took note of our actions and this influenced their behaviour later in the game.

Allowing the player to address characters does not just involve the character handler routine — it also involves the parser, that bit of your program that accepts input from the player. For this reason, we shall not be including it in our program, but you will find that the techniques illustrated will make it simple to implement in your own games. We will, however, be giving our characters something to say. So much for the background. Now, how's it done?

The first problem we have to solve is how to test conditions, because we're going to have to do it a lot and we need an efficient method. If you look at any book on programming Basic adventures you'll see that there are lines upon lines of If statements, since this is the easiest way of testing a condition in Basic. Here are a couple of examples:

```
IF (the player is in the dungeon) AND
IF (the rats are hungry) THEN PRINT
(Aaaaaagh!!!)
IF (the player is in the dungeon) AND
IF (the rats are dead) AND IF (the
player is hungry) THEN PRINT
(Mmmmm! Revenge is sweet!)
IF (the player is not in the dungeon)
THEN PRINT (Freedom is slavery)
and so on ...
```

This is all very well, but you could soon find yourself writing a line full of Ifs for every message you want to print on the screen. However, the good news is that we can do without Ifs altogether! The first step is to look at the problem in a completely different way. Let's take the example above and represent the decision-making process as a "tree" — see diagram 1.

A structure like this is called a decision tree. It is composed of different nodes (the rectangles) connected. The nodes fall into two types —

(continued on next page)

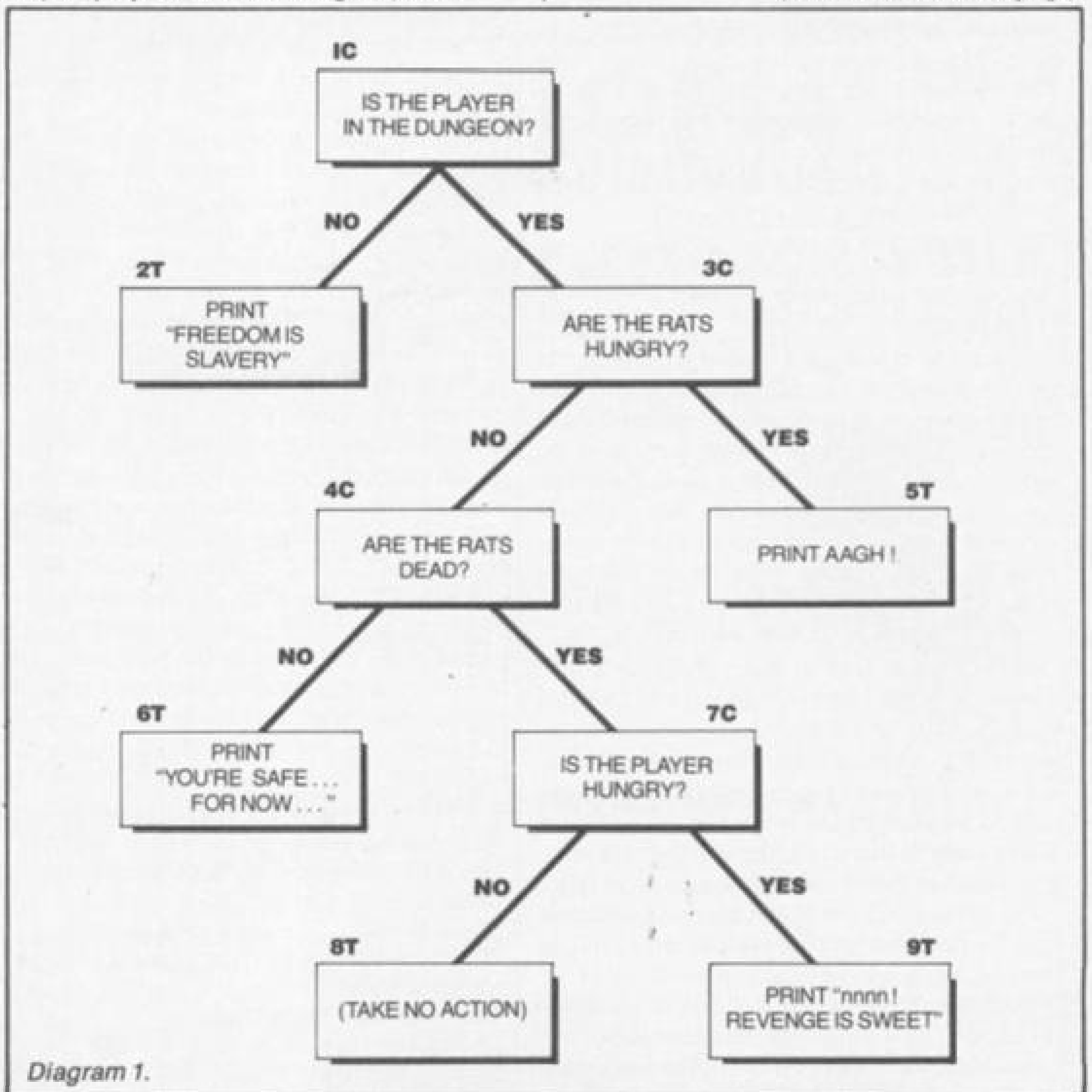
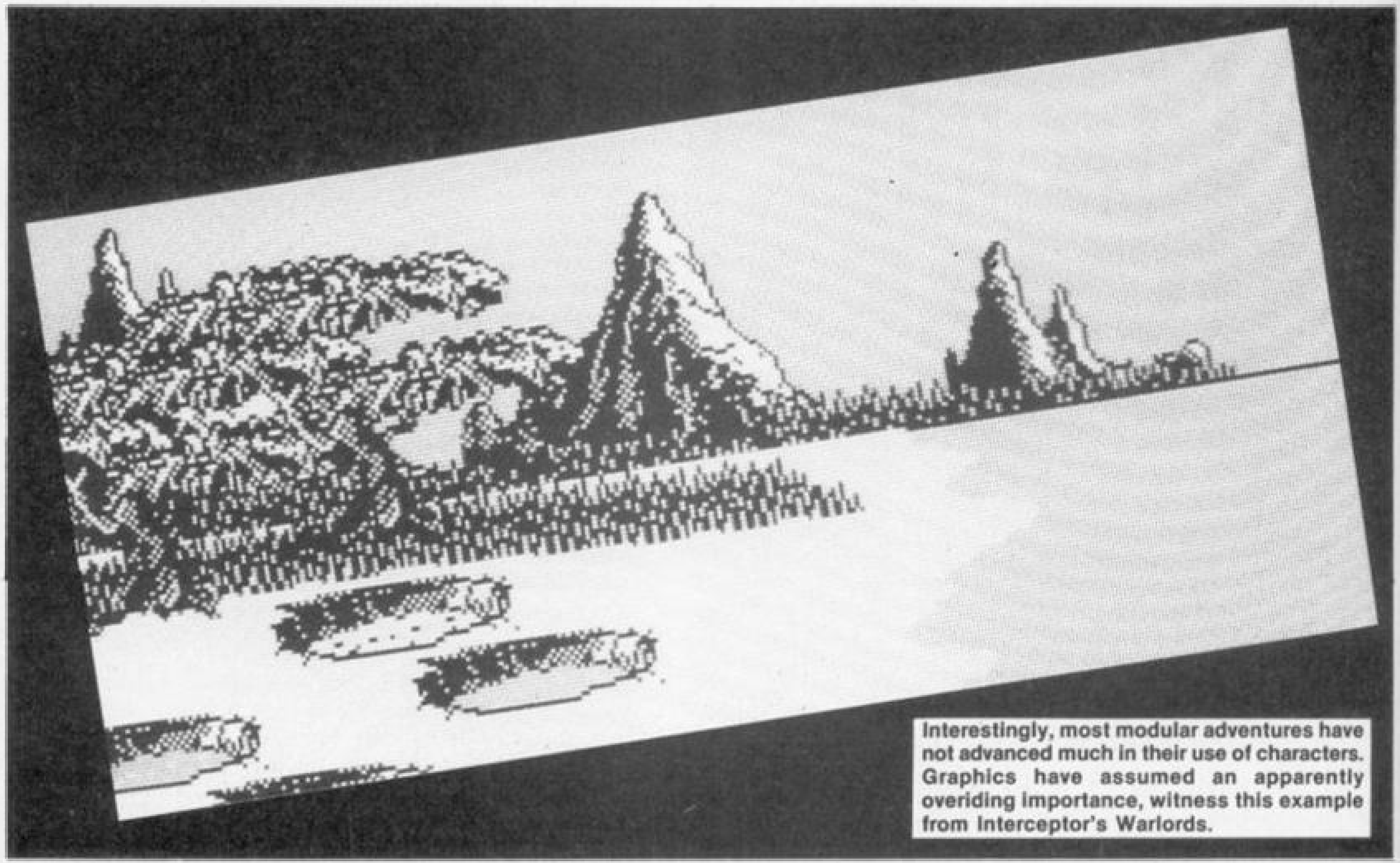


Diagram 1.



Interestingly, most modular adventures have not advanced much in their use of characters. Graphics have assumed an apparently overiding importance, witness this example from Interceptor's Warlords.

(continued from previous page)

choice nodes, which test a condition (such as Is the player in the dungeon?") and terminal nodes, which do not test a condition and have no further branches leading from them. In this diagram, each node has been numbered and given a letter corresponding to its type — C for choice, and T for terminal. The conditions tested correspond to those in our If examples above, though you should be able to see that we have made a simple addition, which could be expressed as:

```
If (the players is in the dungeon) AND
IF (the rats are not hungry) AND IF (the
rats are not dead) THEN PRINT
(You're safe ... for now)
```

Instead of executing a load of If statements, we can enter a tree like this into a Basic program as a set of data, and then traverse it using a short routine. Traversing a tree means starting at the top and working our way down along the different branches until we arrive at the right terminal code, since when we arrive at one of these we know that we have reached the end of the decision process, and can take whatever action is indicated by that particular node.

Let's look at how a Basic program might traverse our rats-in-the-dungeon tree. In order to do this, all our Basic program needs to know is what type each node is — terminal or choice. If it's a choice node, the program will also need to know what condition is to be tested, and both which node to jump to if the condition is true, and which to jump to if the condition is false.

For the moment, we'll assume that our player is in the dungeon and the rats are alive but not hungry. Let's see what happens ... Starting at node one, the program will first check to see if the node is a choice or terminal node. It's a choice node, so next we check the associated condition, and find that it is true.

The program looks up the data for node 1, result true, and finds that the new node to jump to is node 3. The process is repeated and the program jumps to the node associated with node 3, result false. Again the process is repeated for node 4, with the program ending up at node 6. This is a terminal node, so the program stops here and prints the message "You're safe ... for now".

The tree we've just shown is very simple, but trees like this can develop into enormous baobabs of programming complexity, testing hundreds of different conditions, but still — remarkably — taking up very little Ram. The secret is in the way such a structure can be translated into a Basic program, and this is very easy. The first step is to store all the conditions to be tested in an array, so that we can refer to them by numbers.

So, for example, the condition "Is the player in the dungeon?", which like all conditions can evaluate either to zero (false) or non-zero (true), will have its value stored in conditionarray(1); the value of "Are the rats hungry?" will be stored in conditionarray(2), and so on.

All we need to do then is set up an array holding the information for each node. Let's suppose that this array is called the t array. For our example tree, we should Dimension it as follows:

```
DIM t(9,4)
```

The first subscript, 9, is the number of nodes. The second subscript, 4, is the number of different data items we need to store for each node — these are:

(1) node type — choice (indicated by a 0) or terminal (indicated by a 1)
(2) for a choice node, the number of the condition to be tested
(3) for a choice node, the node to branch to if the condition is false
(4) for a choice node, the node to branch to if the condition is true
In the case of terminal nodes, elements 2 and 3 are set to zero, and element 4 holds a number used to select the relevant message from a data store.

As an example, then, the data for node one could be read into the t array from a Data statement as follows:

```
10 FOR n = 1 to 4: READ t(1,n): NEXT
20 DATA 0,1,2,3
```

We could extend this to read data for each of the nine nodes into our array.

Now comes the magic — we can traverse the tree simply by setting a variable 'nodenumber' to one and then using the following routine:

```
IF t(nodenumber,1) = 1 THEN (exit tree
because we've reached a terminal
node) ELSE
nodenumber = t(nodenumber,t
(nodenumber,2) + 3): GOTO (beginning
of line and do again)
```

The first part of the routine simply checks to see if we've reached a terminal node and, if so, jumps out of the traversal process. All you really need to pay attention to is the second part, and the way in which the new node number is assigned to the variable nodenumber.

This is done by getting the relevant record for the current node, and selecting from the array the appropriate node number to branch to next by adding the value of the condition number held in t(n,2) to the number 3, giving us either t(n,3) (if the condition was false) or t(n,4) (if it was true). The routine simply calls itself repeatedly until it finds a terminal node and exits.

In next month's issue, we'll show this technique in action, and begin the process of bringing our characters to life. ■

QUEST Corner

Our man with the brass lamp and the key to a thousand mysteries sheds light on new adventure programs. Lost? Never fear, Hugo North is here.

NEWS

The crystal ball

Windam Classics is the title of a new series of text and graphics adventures based on famous children's books. The series is being marketed on disc for Commodore 64 owners by W.H. Smith Distributers.

There are two types of game. Alice in Wonderland — reviewed this issue — and Below the Root — based on the Green-Sky trilogy — are mainly animated graphics with added text. The more traditional type of adventure can be found in Swiss Family Robinson where text plays a greater role.

Others planned for release include Treasure Island, Robin Hood and The Wizard of Oz. The Worm in Paradise, Level 9's sequel to Snowball and Return to Eden, should be with us any time now.

A helping hand

Dean Cooper of Dudley has found Scott Adams' Secret Mission — formerly Mission Impossible — a trifle tough.

Can't get the yellow key?
WODN IWHG UORH TRED ROCE FWOR HT

Bomb going off?
WODN IWNE KORB YBEG DABS RUET OBAS ESU

Still no joy?
SNOT TUBE TIHW NEHT WOLL EYNE HTDE RHSU PRIA HCNI

Where's the blue key?
POME HTEK AHS



Curiouser and curiouser.

Robin of Sherwood

- *Spectrum/CBM-64/Amstrad*
- *Adventure International*
- *£9.95*

IN THE DAYS of the Lion spawned of Devil's Brood, the Hooded Man shall come to the forest. There he will meet Herne the Hunter, Lord of the Trees, and be his son and do his bidding. The powers of Light and Darkness shall be strong within him. And the guilty shall tremble.

Or, to use prose of a slightly less purple hue, Robin Hood and his merry men are up and about again and all set to duff up the baddies in this new text and graphics adventure.

If the mention of the aforesaid Hooded Man and Herne the Hunter twanged your memory's bowstring, that's probably because this adventure is based on the popular TV series and has been officially licensed from Goldcrest.

Mike Woodroffe has joined forces with programmer Brian Howarth and graphics supremo Teoman Irmak to produce an adventure that is both mentally challenging and visually stirring. If you're a BBC or Electron owner, you'll have to be content with a text-only version at the lower price of £7.95.

Like many of Adventure International's recent releases — Gremlins, Hulk, Spiderman, Sorcerer of Claymorque Castle, etc — Robin of Sherwood boasts superb graphics, the best you'll see in any adventure. The only others I've seen that come near to A.I's standard are those by Terry Greer of Interceptor but you don't get many pics per adventure with theirs.



Riding through the glen — Robin Hood.

Subtitled Touchstones of Rhiannon, the adventure not only casts you as the bold Robin but also casts you straight into a dungeon at the start of the game. Although the opening parallels one of the TV scripts, you may find it a shade difficult to escape from this early predicament. Despair not — A.I. have thought fully given some coded clues on the packaging to get you out of the pit. Before you rush off to Sherwood Forest, you might care to explore the castle. The Lady Marion's in there somewhere and it might pay you to chat her up before you belt off.

Once in the Greenwood, you're sure to meet up with Herne The Hunter, he of the funny headgear. Hatrack-head will tell you that your quest is to find the six Touchstones of Rhiannon and return them home.

Sherwood Forest sure is a large place and you're likely to get lost quite quickly. Keep plugging away though and you'll be rewarded with a stunning animated picture of a waterfall. Elsewhere, you might be lucky enough to stumble across a bewitched John Little, Kirklees Abbey and a grange.

Robin of Sherwood is a visual treat coupled with a testing mission.

Alice in Wonderland

- *Commodore 64*
- *Windham Classics*
- *Disc £14.95*

CURIOUSER AND curiouser! Windham have combined traditional interactive text with command menus, graphics, sound and elements of arcade action.

The result is a charming adventure, offering something for the whole family. The game is based on the Alice books with some new ideas and characters added. You guide an animated Alice through some 250 screens, meeting over 60 different characters.

With the aid of a joystick, Alice can be made to walk, run, climb, crawl, stand, swim, and jump.

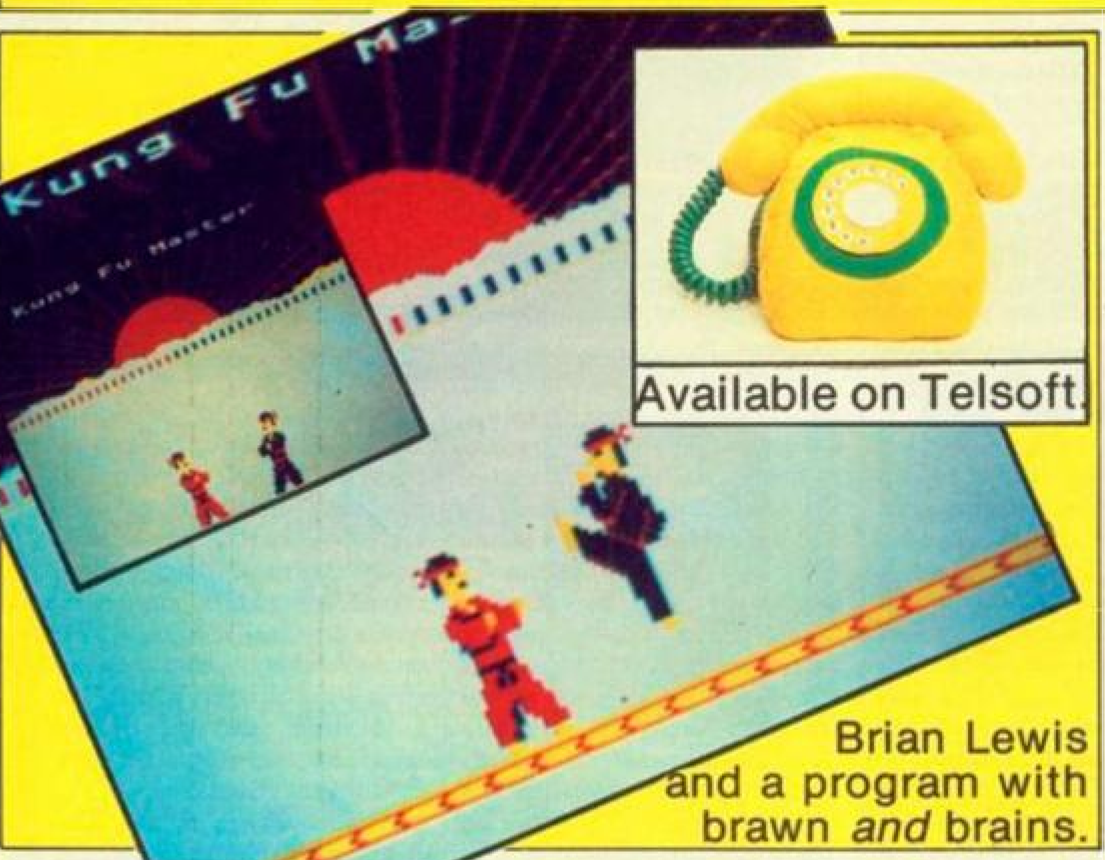
Part of the screen is reserved for entering commands and for receiving textual information. However, you don't have to type a thing — all input is done by means of option menus controlled by your joystick.

Most of the famous characters are there — all are animated — including the Cheshire Cat, the Mad Hatter, the March Hare, the Walrus — but no carpenter — and the White Rabbit.

Alice is a large, engaging and often humorous game. While it is undoubtedly aimed at younger children, many adults will enjoy this entertaining revisit to Wonderland.

Listing 1.

```
   10DATA17,59,7,58,50,50,16,0,204,238,14,228,240,226,
224,192,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,19,7,7,7,3,3
5,17,195,105,239,30,30,30,31,239,0,8,12,135,135,15,15,
8,0,0,0,192,192,128,0,0,1,1,17,1,1,3,3,3,15,15,255,47,
95,95,15,15,8,8,136,8,12,12
   20DATA12,14,0,0,0,0,0,0,0,7,7,7,7,7,7,48,48,47,77
,77,76,136,136,0,128,14,15,15,15,7,7,48,48,0,0,0,0,8,8
,0,128
   30DATA0,2,5,0,0,0,0,0,119,255,15,249,248,248,248,63
,0,136,8,129,193,139,135,15,0,96,224,224,72,72,8,8,1,3
,19,19,3,1,0,0,79,15,15,15,15,31,15,15,15,31,46,76,136
,8,8,8,136,0,0,0,0,0,0,0,0,0,0,0,1,1,3,15,255,47,95,
79,159,47,15,8,136,12,12,142
   40DATA15,15,15,0,0,0,0,0,0,0,0,3,3,7,7,7,119,96,112
,31,46,46,76,76,0,0,0,15,15,7,7,7,102,96,112,0,0,0,0,0
,0,0,0
   50DATA0,2,1,2,0,0,0,0,119,255,15,249,248,248,248,11
2,0,136,8,128,192,136,128,0,0,0,16,16,48,48,22,30,0,0,
1,1,3,3,3,3,60,30,207,47,91,105,105,15,9,15,15,15,15,1
59,46,12,30,14,46,76,136,0,0,0,3,3,1,0,1,1,3,3,79,143,
127,31,47,79,159,15,12,12,204
   60DATA12,142,142,15,15,0,0,0,0,0,0,0,0,3,7,7,7,7,7,
96,112,47,76,76,76,136,136,0,0,15,15,7,3,3,3,48,48,0,8
,8,8,8,8,0,128
   70DATA0,2,5,0,0,0,0,0,119,255,15,249,248,248,248,11
2,0,152,24,145,192,137,129,1,0,128,128,128,128,8,12,12
,0,0,1,1,3,3,3,3,60,30,207,47,91,105,105,15,9,15,15,15
,15,191,12,12,12,12,12,76,136,0,0,0,3,3,1,0,1,1,3,3,79
,143,127,31,47,79,79,15,12,12
   80DATA204,12,142,78,79,15,0,0,0,0,0,0,0,0,3,7,7,7,7
,7,96,112,47,76,76,76,136,136,0,0,15,15,7,3,3,3,48,48,
0,8,8,8,8,8,0,128
   90DATA0,17,59,7,58,50,50,16,0,204,238,14,228,240,22
6,224,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,3,7,31,15,15,1
5,7,192,105,15,15,207,60,60,109,0,0,8,12,14,15,143,111
,0,0,0,0,0,192,192,128,51,1,1,17,1,3,3,3,143,15,31,111
,175,31,14,12,31,76,140,142
   100DATA79,47,15,71,0,0,0,0,0,8,12,14,3,3,3,3,3,16,48
,0,12,12,12,8,8,128,128,0,35,17,0,0,0,0,0,0,30,30,248,
48,0,0,0,0
   110DATA0,0,17,3,21,17,17,0,0,238,255,15,242,240,241,
240,0,0,0,0,0,128,0,0,0,0,0,0,0,0,0,0,3,7,7,7,71,35,
17,104,45,143,79,47,30,30,158,0,0,8,12,30,150,150,206,
0,0,0,0,128,128,0,0,3,3,35,35,17,0,0,17,111,15,63,15,1
5,207,143,63,8,8,0,136,8,8,0
   120DATA0,0,0,0,0,0,0,0,35,33,48,48,1,1,0,0,46,76,1
40,132,12,12,192,224,0,0,0,0,0,0,0,0,0,0,0,0,0,0
   130DATA17,59,7,58,50,50,50,16,204,238,14,228,240,224
,226,44,0,0,0,0,0,192,192,12,0,0,0,0,0,0,0,0,1,3,3,3,7
,7,39,47,14,14,143,79,47,31,15,15,14,14,12,12,76,136,1
1,143,0,0,16,48,52,60,60,60,31,7,3,0,0,0,0,0,31,175,20
7,7,7,7,7,7,15,15,15,31,46,76
   140DATA8,8,12,76,136,0,0,0,0,0,0,0,0,0,0,0,7,7,7
,7,7,7,96,224,8,8,0,0,0,0,0,0,0,0,0,0,0,0,0,0
   150DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,51,119,7,114,
240,116,112,48,136,205,14,197,196,196,128,0,0,0,0,48,4
8,16,0,0,0,17,51,254,254,255,255,17,252,249,143,247,24
7,247,127,143,136,76,238,238,238,204,140,8,0,0,0,0,0,0
,0,0,17,17,1,17,51,51,51,119
   160DATA255,255,15,191,95,95,255,255,136,136,8,136,13
6,204,204,204,0,0,0,0,17,17,0,16,119,255,255,255,238,2
38,192,192,159,155,155,19,1,1,0,16,238,238,238,238,238
,238,192,192
   170DATA0,96,112,112,49,49,17,17,0,17,1,152,184,221,2
54,255,238,255,15,249,241,241,224,243,0,4,8,0,0,0,0,0,
1,0,0,0,0,0,0,0,255,127,55,19,1,17,17,17,253,255,255,2
55,255,127,255,255,136,204,76,76,204,136,0,0,0,0,0,0,0
,0,0,0,17,1,51,51,103,255
   180DATA255,255,255,15,191,95,223,111,191,255,0,0,0,0
```



Available on Telsoft.

Brian Lewis and a program with brawn *and* brains.

Kung Fu Master is fairly unusual as magazine listings go, as it allows either Electron or BBC users to type in the program as it stands and the program itself detects which machine it is running on and makes any necessary changes to the program automatically. This is achieved by reading the value of the Inkey-256 command.

The game is standard Karate-style where each player can execute a certain number of moves, in this case 10, in order to attack his opponent or defend himself. The unusual thing about this game is the size and quality of the graphics; each player being 64 pixels or eight characters high. Such large characters would normally take a large chunk out of the already limited memory and would also result in a huge amount of data which would have to be typed in by the user.

To get around this problem I have used a simple but still effective compression technique; each character is stored in miniature form, in this case four characters high, and then this is expanded up to the full eight characters by the printing routine.

To implement the moves you must use the following combinations of control keys:

Listing 2.

```
   10IF INKEY-256<>0 AND INKEY-256<>-1 THEN epl=100 EL
SE epl=200
   20ENVELOPE1,1,10,1,-1,2,3,1,126,0,0,-126,126,126
   30ENVELOPE3,2,1,1,-1,1,6,2,126,0,0,-126,126,126
   40DATA&10,0,1,0,0,0,4,0,&10,0,3,0,2,0,5,0
   50O%=&4A00:FORT%=0TO15:READD:T%?O%=D:NEXT:pun=O%+12
8:cho=pun+128:blo=cho+128:kic=blo+128:for=kic+128:rou=
for+128:eo=O%:eo2=eo+8
   60J%=eo2+8:FORT=0TO2STEP2:P%=J%:[OPTT
   70LDA#&40:STA&70:LDA#&72:STA&71:LDA#O% MOD256:STA&7
2:LDA#O% DIV256:STA&73:LDA#0:STA&74:STA&80:STA&81:STA&
84:STA&85:STA&86:STA&52:STA&53:LDA#2:STA&77
   80JSRdie
   90.start JSRdie:.M% JSRBOT:JSRdelay
  100LDA&80:BNEc:LDA&84:BNEc:LDX#&9E:JSRkey:CPY#&FF:BN
Ea:JSRrigh:JMPc:.a LDX#&FF:JSRkey:CPY#&FF:BNEb:JSRlef:
JMPc:.b LDX#&BC:JSRkey:CPY#&FF:BNEc:JSRup:.c
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:LDA&8F:BEQk9:JMPkk1:.k9 RTS:.kk1
  120JMPstart
  130.SEF LDA&73:CMP#O% DIV256:BEQCE:JMPCF
  140.die LDA&80:BEQmain:LDA&82:STA&72:LDA&83:STA&73:D
EC&80:BNEmain:LDA#2:STA&77:LDA#0:STA&50:LDA&81:CMP#6:B
EQCF:LDA&72:CMP#O% MOD256:BEQSEF:.CF JSRrub:LDA#O% MOD
256:STA&82:LDA#O% DIV256:STA&83:LDA#4:STA&80:STA&50:.C
E LDA#O% MOD256:STA&72
  150LDA#O% DIV256:STA&73:LDA&50:STA&74:LDA&81:BEQmain
:LDA#0:STA&81:CLC:LDA&70:ADC#&80:STA&70:LDA&71:ADC#2:S
TA&71
  160LDA#0:STA&81
  170.main JMPdial
  180LDY#0:.A LDA(&72),Y:STA(&70),Y:INY:CPY#32:BNEA:CL
C:LDA&70:ADC#&20:STA&4D:LDA&71:ADC#1:STA&4E:.B LDA(&72
),Y:STA(&4D),Y:INY:CPY#64:BNEB:CLC:LDA&4D:ADC#&20:STA&
4D:LDA&4E:ADC#1:STA&4E:.C LDA(&72),Y:STA(&4D),Y:INY:CP
Y#96:BNEC
  190CLC:LDA&4D:ADC#&20:STA&4D:LDA&4E:ADC#1:STA&4E:.D
LDA(&72),Y:STA(&4D),Y:INY:CPY#128:BNED:RTS
  200.rub LDA#&29:STAK1:LDA#0:STAK1+1:JSRdia2:LDA#5:ST
AK1:LDA#&51:STAK1+1:RTS
  210.BLO LDA#1:STA&77:LDA#5:STA&80:STA&74:LDA#blo MOD
256:STA&82:LDA#blo DIV256:STA&83:RTS
  220.en LDA#2:STA&77:RTS
  230.righ LDA#0:STA&77:JSRrub:LDX#&FF:JSRkey:CPY#&FF:
BEQBLO:LDX#&CD:JSRkey:CPY#&FF:BEQPUN:LDX#&BD:JSRkey:CP
Y#&FF:BEQKIC:LDA&86:CMP#16:BEQen:INC&86:CLC:LDA&70:ADC
#8:STA&70:LDA&71:ADC#0:STA&71
  240LDA#2:STA&80:LDA#3:STA&77
  250STA&74:LDA#for MOD256:STA&82
  260LDA#for DIV256:STA&83:RTS:.PUN JSRSO:LDA#5:STA&80
:LDA#pun MOD256:STA&82:LDA#pun DIV256:STA&83:LDA#4:STA
&77:RTS:.KIC JSRSO:LDA#5:STA&80:LDA#kic MOD256:STA&82:
LDA#kic DIV256:STA&83:RTS
  270.ne RTS
  280.lef LDA#0:STA&77:LDX#&CD:JSRkey:CPY#&FF:BEQfly2:
LDX#&BD:JSRkey:CPY#&FF:BEQROU:LDA&86:BEQne:DEC&86:JSRr
ub:SEC:LDA&70:SBC#8:STA&70:LDA&71:SBC#0:STA&71:LDA#for
 MOD256:STA&82
  290LDA#for DIV256:STA&83:LDA#3:STA&77:STA&74:LDA#2:S
TA&80:RTS:.ROU JSRrub:LDA#5:STA&80:LDA#rou MOD256:STA&
82:LDA#rou DIV256:STA&83:JMPSO
  300.fly2 JSRrub:JSRSO:SEC:LDA&70:SBC#&80:STA&70:LDA&
71:SBC#2:STA&71:LDA#6:STA&80:LDA#1:LDA&84:BNEH2:LDA#1:
STA&81:LDA#4:STA&77:.H2 LDA#rou MOD256:STA&82:LDA#rou
DIV256:STA&83:RTS
  310.CHO LDA#4:STA&77:LDA#5:STA&80:LDA#cho MOD256:STA
&82:LDA#cho DIV256:STA&83:RTS
  320.up JSRrub:LDX#&CD:JSRkey:CPY#&FF:BNE1:JMPfly:.1
LDX#&BD:JSRkey:CPY#&FF:BEQCHO:.jump SEC:LDA&70:SBC#&80
:STA&70:LDA&71:SBC#2:STA&71:LDA#4:STA&80:LDA#2:STA&77:
STA&74:LDX#6:STX&81:DEX:STX&77:RTS
  330SBC#&38:STA&70:LDA&71:SBC#1
  340STA&71:RTS:.fle DEC&86:SEC:LDA&70:SBC#&40:STA&70:
LDA&71:SBC#1:STA&71:RTS:.st SEC:LDA&70:SBC#&40:STA&70:
LDA&71:SBC#1:STA&71:RTS:.down LDA&85:CMP#1:BEQFLE:CMP#
0:BEQST:INC&86:CLC:LDA&70:ADC#&40:STA&70:LDA&71:ADC#1:
STA&71:RTS:.FLE DEC&86:CLC
  350LDA&70:ADC#&38:STA&70:LDA&71:ADC#1:STA&71:RTS:.ST
 CLC:LDA&70:ADC#&40:STA&70:LDA&71:ADC#1:STA&71:RTS
  360.fly JSRSO:SEC:LDA&70:SBC#&80:STA&70:LDA&71:SBC#2
:STA&71:LDA#6:STA&80:LDA#1:LDA&84:BNEH:LDA#1:STA&81:.H
 LDA#kic MOD256:STA&82:LDA#kic DIV256:STA&83:RTS
  370.SO LDX#eo MOD256:LDY#eo DIV256:LDA#7:JMP&FFF1
  380.key LDY#&FF:LDA#&81:JMP&FFF4:.delay LDX#100:.E L
DY#100:.F DEY:BNEF:DEX:BNEE:RTS
  390.dia2 LDX#0:LDA&70:STA&75:LDA&71:STA&76:JSRdia3:C
LC:LDA&70:ADC#8:STA&75:LDA&71:ADC#0:STA&76:JSRdia3:CLC
:LDA&70:ADC#16:STA&75:LDA&71:ADC#0:STA&76:JSRdia3:CLC:
LDA&70:ADC#24:STA&75:LDA&71:ADC#0:STA&76:JSRdia3
  400CLC:LDA&70:ADC#&80:STA&75:LDA&71:ADC#2:STA&76:JSR
dia3:CLC:LDA&70:ADC#&88:STA&75:LDA&71:ADC#2:STA&76:JSR
dia3:CLC:LDA&70:ADC#&90:STA&75:LDA&71:ADC#2:STA&76:JSR
dia3:CLC:LDA&70:ADC#&98:STA&75:LDA&71:ADC#2:STA&76:JSR
dia3
  410CLC:LDA&70:ADC#0:STA&75:LDA&71:ADC#5:STA&76:JSRdi
a3:CLC:LDA&70:ADC#8:STA&75:LDA&71:ADC#5:STA&76:JSRdia3
:CLC:LDA&70:ADC#16:STA&75:LDA&71:ADC#5:STA&76:JSRdia3:
CLC:LDA&70:ADC#24:STA&75:LDA&71:ADC#5:STA&76:JSRdia3
  420CLC:LDA&70:ADC#&80:STA&75:LDA&71:ADC#7:STA&76:JSR
dia3:CLC:LDA&70:ADC#&88:STA&75:LDA&71:ADC#7:STA&76:JSR
dia3:CLC:LDA&70:ADC#&90:STA&75:LDA&71:ADC#7:STA&76:JSR
dia3:CLC:LDA&70:ADC#&98:STA&75:LDA&71:ADC#7:STA&76:JSR
dia3
  430RTS:.[?] LDX#&9D:JSRkey:CPY#&FF:BNEk7:LDA#1:STA&5
2:.k7 RTS
  440.dia3 JSRRIP:CLC:LDA&75:ADC#&40:STA&75:LDA&76:ADC
#1:STA&76:.RIP LDY#&FF:.K INY:JSRrip:INY:JSRrip:INX:CP
Y#7:BNEK:RTS:.rip STY&50:LDA(&75),Y:STA&51:TXA:TAY:LDA
(&72),Y:.K1 ORA&51:LDY&50:STA(&75),Y:RTS
  450.cru JSRrub:SEC:LDA&70:SBC#8:STA&70:LDA&71:SBC#0:
STA&71:DEC&86:LDA#7:LDX#eo2 MOD256:LDY#eo2 DIV256:JMP&
FFF1
  460]:NEXT:delay?1=epl:E?1=epl
  470CHAIN""
```

```
,0,136,136,204,0,0,0,0,0,0,0,0,255,255,238,238,238,14,
96,224,127,55,55,19,19,0,0,0,204,204,238,238,238,238,9
6,224
190DATA0,0,128,128,192,192,230,247,0,17,1,16,48,17,1
6,0,238,255,15,249,241,241,241,224,0,4,8,4,0,0,0,0,247
,119,55,19,1,0,0,0,153,255,255,255,255,111,55,51,243,2
47,207,191,125,249,249,255,0,0,136,136,204,204,204,204
,0,0,0,0,0,0,0,0,51,51,3,51
200DATA103,103,255,255,223,239,31,127,191,223,111,25
5,204,204,136,0,136,136,204,204,0,17,17,17,17,17,0,16,
255,255,238,204,204,204,192,192,191,19,19,19,1,1,0,0,2
04,238,238,238,238,238,96,224
210DATA0,16,16,16,16,17,51,51,0,145,129,152,48,153,1
52,136,238,255,15,249,241,241,241,224,0,4,10,0,0,0,0,0
,51,51,51,19,1,0,0,0,153,255,255,255,255,47,51,51,243,
247,207,191,125,249,249,255,0,0,136,136,204,204,204,20
4,0,0,0,0,0,0,0,0,51,51,3,51
220DATA103,87,223,255,223,239,31,127,191,223,223,255
,204,204,136,0,136,136,204,204,0,17,17,17,17,17,0,16,2
55,255,238,204,204,204,192,192,191,19,19,19,1,1,0,0,20
4,238,238,238,238,238,96,224
230DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,51,119,7,11
4,240,116,112,0,136,205,14,197,196,196,128,0,0,0,0,0,4
8,48,16,0,0,17,51,119,255,239,159,48,249,255,255,207,2
43,243,219,0,204,238,127,255,255,255,238,0,0,0,0,0,17,
51,119,127,19,35,103,223,191
240DATA255,206,239,255,127,159,175,127,119,51,12,136
,136,8,136,204,204,204,247,247,225,192,0,0,0,0,140,8,0
,0,0,0,0,0,51,51,51,17,17,16,16,0,204,204,204,204,204,
128,192,0
250DATA0,0,0,0,0,0,0,0,0,0,0,0,16,0,0,0,119,255,15
,244,240,248,240,0,0,136,12,138,136,136,0,0,0,0,0,16,1
6,0,0,0,0,17,51,247,246,246,71,113,251,239,223,191,247
,247,231,0,204,238,238,238,206,140,8,0,0,0,0,0,0,0,0,1
7,17,0,1,17,17,0,0,159,255,63
260DATA255,255,207,239,63,204,204,140,140,8,0,0,8,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,55,19,35,50,51,51,48,112
,140,200,192,192,136,136,0,0
270DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,48,48,51,51,119,7,1
14,240,112,116,115,136,205,14,197,196,196,196,128,0,0,
128,192,226,243,243,243,119,119,51,51,19,1,221,239,119
,119,239,223,191,127,255,255,136,204,204,204,238,238,1
74,191,51,19,1,0,0,0,0,0,255
280DATA255,255,127,55,19,17,17,127,175,207,238,238,2
38,238,238,127,238,204,0,0,0,0,0,0,0,0,0,0,0,0,0,17,17
,0,0,0,0,0,0,238,238,238,238,238,238,96,112,0,0,0,0,0,
0,0,0
290DATA0,0,0,0,0,0,0,0,0,0,0,0,0,48,112,115,112,0,0,0,
0,192,224,230,224,0,0,0,0,0,0,0,0,0,0,0,0,3,7,7,112,
113,113,23,15,15,15,143,232,228,228,78,15,15,15,31,0,0
,0,0,0,12,14,14,23,71,71,35,3,23,47,31,15,143,79,60,25
2,30,15,15,15,31,47,135,243
300DATA195,15,15,142,14,46,76,12,142,79,175,15,15,15
,143,71,35,16,16,143,79,47,31,15,15,143,199,31,47,79,1
43,79,60,60,60,15,15,15,31,46,76,128,128
310H%=&4FFE:FORT%=0TO1919:READD:T%?H%=D:NEXT
320MODE5:VDU19,0,7;0;19,3,0;0;18,0,2:FORT%=0TO1279ST
EP128:MOVE640,512:DRAWT%,0:MOVE640,512:DRAWT%,1023
330NEXT:FORT%=0TO1024STEP64:MOVE640,512:DRAW0,T%:MOV
E640,512:DRAW1279,T%:NEXT
340GCOL0,1:PROCCIRC(640,512,250):PRINTTAB(3,1);"Kung
 Fu Master"TAB(5,2);"Is Loading"
350IF INKEY-256<>-1 AND INKEY-256<>0 THEN A$="Electr
on" ELSE A$="BBC'B'"
360A$=A$+" Version":PRINTTAB((20-LENA$)/2,6);A$
370VDU28,1,30,18,24,17,131,17,0,12
380CHAIN""
390DEFPROCCIRC(X,Y,R)
400FORI=Y+R TO Y-R STEP-4:J=SQR(ABS(R*R-(I-Y)*(I-Y))
):MOVEX-J,I:DRAWX+J,I:NEXT:ENDPROC
```

KUNG FU MASTER

Forward/Backward/Jump — self explanatory.
Punch — Forward and up.
Face shove — Jump and down.
High kick — Backward and up.
Mid kick — Backward and down.
Lower Mid Kick — Jump and up.
Jab Kick — Forward and down.
Block — Forward and backward.

The actual keys for the players are:

Key Function	Player 1	Player 2
Forward	'Z'	','
Backward	shift	'.'
Jump	'F'	Return
Down	'X'	'?'
Up	'D'	':'

All four listings should be typed in and saved one after the other on the same cassette. If your cassette recorder has no motor control then allow quite a large gap between programs.

If you do not want to type in the game but do wish to play it simply send me a blank cassette and large s.a.e. and I will record the game for you free of charge. Brian Lewis, 47 Highlands Road, Bridgnorth, Shropshire WV16 5BZ. ■

Listing 3.

```
10IF INKEY-256<>0 AND INKEY-256<>-1 THEN eo2=100 EL
SE eo2=200
20ENVELOPE2,2,-1,3,2,1,3,1,126,0,0,-126,126,126
30?&266=1:?&263=&11
40VDU23,129,0,60,60,60,60,60,60,0
50DATA&10,0,2,0,4,0,2,0,&10,0,3,0,5,0,5,0,&10,0,1,0
,0,0,4,0
60?&78=&60:?&79=&73:?&7A=H%+896:?&7B=(H%+896) DIV25
6:?&89=36:?&88=0:?&7C=0:?&8D=2:?&8E=10:?&8F=10
70pu2=H%+128:ch2=pu2+128:bl2=ch2+128:ki2=bl2+128:fo
2=ki2+128:ro2=fo2+128
80sta=H%+896:pun=sta+128:cho=pun+128:blo=cho+128:ki
c=blo+128:for=kic+128:rou=for+128
90A$="...............Play Kung Fu Master if you da
re.....a game of skill and determination.....where intel
ligence and swiftness are essential to stay alive.....
..........."
100DIM W% 2000:FORT=0TO23:READD:T?W%=D:NEXT:eo2=W%+8
:eo3=eo2+8:F%=eo3+8:$F%=A$:G%=F%+165:FORT=0TO2STEP2:P%
=G%:[OPTT
110LDX&60:INX:TXA:AND#3:STA&60:LDA#0:STA&53
120LDA&88:BNEc:LDA&7C:BNEc:LDX#&99:JSRkey:CPY#&FF:BN
Ea:JSRFoR:JMPc:.a LDX#&98:JSRkey:CPY#&FF:BNEb:JSRBaC:J
MPc:.b LDX#&B6:JSRkey:CPY#&FF:BNEc:JSRJuM:.c
130JSRjudge:LDA&53:BEQk9:JSRcru:.k9
140JMPdie
150.eef1 LDA&7C:BNEno:LDA&7A:CMP#sta MOD256:BNEno:LD
A&7B:CMP#sta DIV256:BNEno:LDX#0:RTS:.no LDX#&FF:RTS
160.die LDA&88:BEQdie2:DEC&88:LDA&8A:STA&7A:LDA&8B:S
TA&7B:LDA&88:BNEdie2:LDA#2:STA&8D:JSReef1:CPX#&FF:BNEk
3:JSRrub:LDA#4:STA&88:LDA#sta MOD256:STA&8A:LDA#sta DI
V256:STA&8B:.k3 LDA#sta MOD256:STA&7A:LDA#sta DIV256:S
TA&7B
170LDA&7C:BEQdie2:LDA#0:STA&7C:JSRrub:CLC:LDA&78:ADC
#&80:STA&78:LDA&79:ADC#2:STA&79
180.die2 LDX#0:LDA&78:STA&75:LDA&79:STA&76:JSRdie3:C
LC:LDA&78:ADC#8:STA&75:LDA&79:ADC#0:STA&76:JSRdie3:CLC
:LDA&78:ADC#16:STA&75:LDA&79:ADC#0:STA&76:JSRdie3:CLC:
LDA&78:ADC#24:STA&75:LDA&79:ADC#0:STA&76:JSRdie3
190CLC:LDA&78:ADC#&80:STA&75:LDA&79:ADC#2:STA&76:JSR
die3:CLC:LDA&78:ADC#&88:STA&75:LDA&79:ADC#2:STA&76:JSR
die3:CLC:LDA&78:ADC#&90:STA&75:LDA&79:ADC#2:STA&76:JSR
die3:CLC:LDA&78:ADC#&98:STA&75:LDA&79:ADC#2:STA&76:JSR
die3
200CLC:LDA&78:ADC#0:STA&75:LDA&79:ADC#5:STA&76:JSRdi
e3:CLC:LDA&78:ADC#8:STA&75:LDA&79:ADC#5:STA&76:JSRdie3
:CLC:LDA&78:ADC#16:STA&75:LDA&79:ADC#5:STA&76:JSRdie3:
CLC:LDA&78:ADC#24:STA&75:LDA&79:ADC#5:STA&76:JSRdie3
210CLC:LDA&78:ADC#&80:STA&75:LDA&79:ADC#7:STA&76:JSR
die3:CLC:LDA&78:ADC#&88:STA&75:LDA&79:ADC#7:STA&76:JSR
die3:CLC:LDA&78:ADC#&90:STA&75:LDA&79:ADC#7:STA&76:JSR
die3:CLC:LDA&78:ADC#&98:STA&75:LDA&79:ADC#7:STA&76:JSR
die3
220RTS
230.die3 JSRRIP:CLC:LDA&75:ADC#&40:STA&75:LDA&76:ADC
#1:STA&76:.RIP LDY#&FF:.K INY:JSRrip:INY:JSRrip:INX:CP
Y#7:BNEK:RTS:.rip STY&50:LDA(&75),Y:STA&51:TXA:TAY:LDA
(&7A),Y:.K1 ORA&51:LDY&50:STA(&75),Y:RTS
240.BaC JSRrub:LDX#&97:JSRkey:CPY#&FF:BEQMiD:LDX#&B7
:JSRkey:CPY#&FF:BEQHiG:LDA&89:CMP#36:BEQne:CLC:LDA&78:
ADC#8:STA&78:LDA&79:ADC#0:STA&79:INC&89:LDA#for MOD256
:STA&8A:LDA#for DIV256:STA&8B:LDA#2:STA&88:.ne RTS:.Mi
D JSRSO3:LDA#5:STA&88
250LDA#rou MOD256:STA&8A:LDA#rou DIV256:STA&8B:LDA#0
:STA&8D:RTS:.HiG JSRSO3:LDA#6:STA&88:STA&7C:LDA#rou MO
D256:STA&8A:LDA#rou DIV256:STA&8B:SEC:LDA&78:SBC#&80:S
TA&78:LDA&79:SBC#2:STA&79:LDA#4:STA&8D:RTS
260.FoR JSRrub:LDX#&B7:JSRkey:CPY#&FF:BEQPuM:LDX#&98
:JSRkey:CPY#&FF:BEQBlO:LDX#&97:JSRkey:CPY#&FF:BEQJaB:L
DA&89:CMP#19:BEQee:SEC:LDA&78:SBC#8:STA&78:LDA&79:SBC#
0:STA&79:DEC&89:LDA#for MOD256:STA&8A:LDA#for DIV256:S
TA&8B:LDA#2:STA&88:.ee RTS
270.PuM JSRSO3:LDX#5:STX&88:DEX:STX&8D:LDA#pun MOD25
6:STA&8A:LDA#pun DIV256:STA&8B:RTS:.BlO LDA#1:STA&8D:L
DA#5:STA&88:LDA#blo MOD256:STA&8A:LDA#blo DIV256:STA&8
B:RTS:.JaB JSRSO3:LDA#0:STA&8D:LDA#5:STA&88:LDA#kic MO
D256:STA&8A:LDA#kic DIV256
280STA&8B:RTS
290.JuM JSRrub:LDX#&97:JSRkey:CPY#&FF:BEQChO:LDA#4:S
TA&88:STA&7C:LDA#5:STA&8D:SEC:LDA&78:SBC#&80:STA&78:LD
A&79:SBC#2:STA&79:LDX#&B7:JSRkey:CPY#&FF:BEQJj:RTS:.Jj
 JSRSO3:LDA#0:STA&8D:LDA#6:STA&88:LDA#kic MOD256:STA&8
A:LDA#kic DIV256:STA&8B:RTS
300.ChO JSRSO3:LDA#4:STA&8D:LDA#5:STA&88:LDA#cho MOD
256:STA&8A:LDA#cho DIV256:STA&8B:RTS
310.rub LDA#&29:STAK1:LDA#0:STAK1+1:JSRdie:LDA#5:STA
K1:LDA#&51:STAK1+1:RTS
320.key LDY#&FF:LDA#&81:JMP&FFF4
330.den RTS:.judge LDA&86:CMP#16:BNEden:LDA&89:CMP#1
9:BNEden:LDA&77:BEQp11A:LDA&8D:BEQp12A:LDA&77:CMP#4:BE
Qp11H:LDA&8D:CMP#4:BEQp12H
340RTS
350.p11A LDA&8D:BEQden:LDA&80:CMP#4:BNEden:JMPPL2:.p
12A LDA&77:BEQden:LDA&86:CMP#4:BNEden:JMPPL1
360.p11H LDA&8D:CMP#1:BEQden:LDA&80:CMP#3:BNEden:JMP
PL2:.p12H LDA&77:CMP#1:BEQden:LDA&86:CMP#4:BNEden:JMP
L1
370.PL1 LDA#31:STA&52:JSR&FFEE:SEC:LDA&8E:SBC#1:JSR&
FFEE:LDA#12:JSR&FFEE:LDA#32:JSR&FFEE:DEC&8E:JMPhit:.PL
2 LDA#31:STA&53:JSR&FFEE:SEC:LDA#20:SBC&8F:JSR&FFEE:LD
A#12:JSR&FFEE:LDA#32:JSR&FFEE:DEC&8F
380.hit LDA#7:LDX#W% MOD256:LDY#W% DIV256:JMP&FFF1:.
SO3 LDA#7:LDX#eo3 MOD256:LDY#eo3 DIV256:JMP&FFF1
390.cru INC&89:JSRrub:CLC:LDA&78:ADC#8:STA&78:LDA&79
:ADC#0:STA&79:LDX#eo2 MOD256:LDY#eo2 DIV256:JMP&FFF1
400.QN LDA#&C0:STA&78:LDA#&4A:STA&79:LDA#pu2 MOD256:
STA&7A:LDA#pu2 DIV256:STA&7B:LDA#0:STA&80:JSRdie:LDA#&
E0:STA&78:LDA#&4B:STA&79:LDA#pun MOD256:STA&7A:LDA#pun
 DIV256:STA&7B:LDA#0:STA&80:JSRdie
410LDA#0:STA&78:LDA#F% MOD256:STA&7A:LDA#F% DIV256:S
TA&7B:.tere LDA#31:JSR&FFEE:LDA#1:JSR&FFEE:LDA#15:JSR&
FFEE:LDY#0:.tA LDA(&7A),Y:JSR&FFEE:INY:CPY#16:BNEtA:CL
C:LDA&7A:ADC#1:STA&7A:LDA&7B:ADC#0:STA&7B
411LDA#&81:LDX#&90:LDY#&FF:JSR&FFF4:CPY#&FF:BNEQN:RT
S:.QN
420LDX#200:.tty LDY#100:.yTT DEY:BNEyTT:DEX:BNEtty:I
NC&78:LDA&78:CMP#148:BNEuIQ:LDA#0:STA&78:LDA#F% MOD256
:STA&7A:LDA#F% DIV256:STA&7B:.uIQ JMPtere
430]:NEXT:W%?1=G% W%?2=G% DIV256:tty?1=ep2
440CHAIN""
```

Listing 4.

```
10DATA&60,60,88,60,60,80,60,76,88,88,76,76,80,80,60
20VDU23,128,0,255,4,8,8,4,255,0
30MODE5:VDU19,0,7;0;19,3,0;0;28,0,12,19,0,17,131,12
,26,17,128,23;8202;0;0;0;10,0,1
40PROCscene
50COLOUR128:COLOUR1:PRINTTAB(0,23);"Press Space To
Start":COLOUR3:CALLQN
60VDU28,0,23,19,14,12,26
70?&78=&60:?&79=&73:?&7A=H%+896:?&7B=(H%+896) DIV25
6:?&89=36:?&88=0:?&7C=0:?&8E=10:?&8F=10
80pu2=H%+128:ch2=pu2+128:bl2=ch2+128:ki2=bl2+128:fo
2=ki2+128:ro2=fo2+128
90sta=H%+896:pun=sta+128:cho=pun+128:blo=cho+128:ki
c=blo+128:for=kic+128:rou=for+128
100COLOUR130:COLOUR1:PRINTTAB(0,29);STRING$(20,CHR$1
28);:COLOUR128:PRINTTAB(0,12);STRING$(10,CHR$129);:COL
OUR3:PRINTTAB(10,12);STRING$(10,CHR$129);
110CALLJ%:COLOUR128:COLOUR1:CLS
120RESTORE10:FORT=0TO14:READD
130SOUND&11,-15,D,4:FORC=0TO200:NEXT:*FX21,5
140NEXT
150*FX15,1
170COLOUR2:COLOUR128:IF ?&8E=0 A$="Black" ELSE A$="R
ed"
180A$=A$+" Wins":PRINTTAB((20-LENA$)/2,19);A$
200GOTO40
210DEFPROCmount(X%):Y%=639:FORT%=0TO1279STEP8:MOVET%
,607:DRAWT%,Y%:A%=RND(4):IF A%>3 AND Y%>639 Y%=Y%-4 E
LSE IF Y%<X% Y%=Y%+4
220NEXT
230ENDPROC
240DEFPROCCIRC(X,Y,R):LOCALI,J:FORI=Y+R TO 611 STEP-
4:J=SQR(ABS(R*R-(I-Y)*(I-Y))):MOVEX-J,I:DRAWX+J,I:NEXT
:ENDPROC
250DEFPROCscene:VDU28,0,12,19,0,17,131,12,26,18,0,1:
FORT%=128TO1279STEP128:MOVE640,607:DRAWT%,1023:NEXT:FO
RT%=607TO1024STEP64:MOVE640,607:DRAW0,T%:MOVE640,607:D
RAW1279,T%:NEXT
260GCOL0,1:PROCCIRC(640,607,200):GCOL0,2:PROCmount(6
80):GCOL2,0:PROCmount(670):GCOL0,2:MOVE0,604:DRAW1279,
604
270VDU5:GCOL0,0:MOVE192,959:PRINT"Kung Fu Master":V
DU4:COLOUR0:ENDPROC
```



"My two sun spots"

1. Souls of Darkon
by Taskset
Sorry about the summer – a wee bit disappointing I'm afraid, but here's something to cheer you up. A super game sizzling with excitement!

2. Scooby Doo
by Elite
This game is full of ghosties and ghoulies and mysterious happenings. Good old Scooby is back and so is my dear friend Mrs McUrioch. (Her name is almost as difficult as mine!)

"Press the magic button and the picture changes"

Geoff Capes Strong Man

by Martech

Let's hear it for Geoff Capes. The World's strongest man. Did you know he is World Highland Games Champion too? Can you beat that? Well, with this game you can try. Six major challenges in all, and always a blue sky above so no chance of rain stopping play. Versions for most machines.

Cassette £7.95 and £8.95
Disk £14.95

Arnhem

by CCS

1944 all over again, and what's this – a strong front advancing over Holland? Um, yes, of course it's the Allies attacking the Germans and they need your help. With bridges to capture and strategy to work out, it's as complicated as weather forecasting – but much more fun! (Sorry Michael).

Spectrum 48K £8.95
Amstrad £9.95

Strike Force Harrier

by Mirrorsoft

What's faster than a hurricane and more devastating than a tornado? You've got it in one. Strike Force Harrier – the flight simulator that streaks through the skies like lightning. You are loaded with bombs to destroy the enemy – but watch out for the clouds of enemy fighters on the horizon.

BBC B and Electron £9.95

Marsport

by Gargoyle Games

This large dome on your screens is a force sphere protecting the Earth from attack by Sept Warriors. It's a wee bit scary as the sphere is weakening and the strengthening plans are in an occupied town. All in all a gloomy outlook. Can you change that?

Spectrum 48K and Amstrad £9.95

THORN EMI Computer Software
International Micro Software Division

"Look what my charts are showing"

HIGHWAY ENCOUNTER

by Vortex

Temperatures are rising fast. But it's not a heatwave, I'm afraid. The Aliens have landed. To save the globe from domination you have to activate the 5 Vortons and the deadly Lasertron. Dodging hailstorms of bullets you must boldly go forth to save the planet. (I think I'd rather stay at the Met office.)

Spectrum 48K and Amstrad £7.95

SCOOBY DOO

by Elite

The team of top sleuths is back. This lot could sniff out a sunbeam! Stunning graphics and super smooth action give this game a touch of class.

Spectrum 48K	£6.95
Commodore 64	£7.95
Amstrad	£8.95

WORLD CUP

by Arctic Computing

This league table reads MUCH better than my round the world temperature chart. But then top teams are involved, and you get the chance to pick the players and score the goals. Och, what could be fairer than that, ref?

Spectrum and C16	£6.95
Commodore 64 and Amstrad	£7.95

Screen Shot GRAPHICS PACK

by Dorling Kindersley

Are you interested in really good value? I am too, and this books plus software pack has loads of routines for creating lovely graphics. There are over 200 sprite designs alone! Gosh, it's um well unbelievable – top class graphics, super fast speeds and hi-res reults.

Spectrum, Commodore 64 and Spectrum+ £15.95

ghs for Autumn'

COMPUTER HITS

by Beau Jolly

A summary chart of all that's the best in computer games. But on this chart not a depression in sight! Every one is guaranteed to keep you smiling rain or shine. There are sports, simulations, arcade and adventures. Oh, and yes, I almost forgot, a version for most machines.

10 games	£9.95
6 games	£6.95

GANDALF

by Tymac

Two great games now on Spectrum. Gandalf – a man after my own heart – throws thunderbolts from his fingertips.

FLYER FOX

by Tymac

It's not raindrops falling on your head but fireballs from a Mig fighter.

Spectrum 48K Each game **£7.95**

"Super plays for rainy days"

Souls of DARKON

by Taskset

Not for the faint of heart this one. You must venture beyond the sun and through the gof – oops sorry fog (no, not to Lanzarote) to Megron, where the trick is to free the people from the curse of Darkon. Oh dear, quite a challange, but YOU can succeed.

Amstrad £8.90

Old Scores

by Global Software

Solving this is like finding a snowflake in July (or deciphering one of my maps). Private Investigators will love it, and if you have never been lost around London's South Bank, here's your chance. Solve the mystery, explore the theatres, and become famous!

Spectrum 48K	£6.95
Amstrad and Commodore 64	£7.95

Graham Gooch's TEST CRICKET

by Audiogenic

A super game for all seasons. Complete with googlies, silly mid-offs, authentic scoreboards and starplayers – relive the highlights of summer!

Commodore 64 (Cassette)	£9.95
Commodore 64 (Disk)	£11.95

Paintbox

by Audiogenic

The graphics package which gives you much more than squiggly lines and cloud shapes. It has everything you need to produce high resolution pictures. Do you think the beeb would be interested?

Spectrum, Commodore 64 and 16 £9.95

The Secret Diary of Adrian Mole aged 13¾

by Mosaic

It's no fun being me. What with the sun turning to snow overnight and always having to look on the bright side. Now if I was a budding intellectual and poet like Adrian all my problems could be turned into great fun. And maybe they'd make me into a game too. (Well, I can dream.)

Versions for most machines.

Cassette	£9.95
Disk	£12.95

"Games to bring you Winter cheer"

BLADE RUNNER

by CRL

Gosh, here's a chance to be a bounty hunter *and* save the world. Scattered showers of Replidroids have run amok. These human look-alikes have to be pinpointed, tracked down and 'retired' if the outlook is to be at all sunny.

Commodore 64 £8.95

Win



SPOT THIS MONTH'S MYSTERY MICROGAMER AND WIN A FANTASTIC PRIZE. TEN 2-PACK PROGRAM PRIZES MUST BE WON PLUS SINGLE GAME PRIZES FOR THE FIRST 100 RUNNERS UP.

If you think you know the answer, send this coupon to us, no later than 14 November 1985. The first ten correct entries will each receive SCOOBY DOO and SOULS OF DARKON. 100 runners up will each receive a super game for their machine type.

I say the Mystery Microgamer is: ____________

Send me your latest full list of software programs.

Name ____________

Machine ____________

Address ____________

____________ Postcode ____________ YC3

Send to: THORN EMI Computer Software Mystery Microgamer Competition
Thomson House, 296 Farnborough Road, Farnborough, Hants GU14 7NU

Prizewinners
David Cook, London
M Patel, Manchester
Lee Gardner, Norbury
Mike Davies, Llandeilo
Sarah Tansley, Uxbridge
Billy Marshall, Leeds
William Clark, Kingsthorpe
David Morris, Weston Super Mare
Mary Dolan, Preston
Amil K Seth, Wantage



Last month's mystery Microgamer was Tracy Ullman. 10 prizes are on the way.

KEY CHOICES

Choosing electronic instruments can be as confusing to the newcomer from the world of computing as choosing a computer is for the musician.

MIDI-equipped instruments and accessories come in a variety of shapes and sizes, with price-tags from under £200 to £40,000 or more.

The first instrument you are likely to want is a synthesiser. Two years ago you would probablay have had to spend at least £1,000 for a MIDI-equipped synth. Now you have a choice of models retailing at under £500.

Of these, probably the most attractive from the computer user's point of view is Casio's £345 CZ-101 synthesiser.

The CZ-101 is the smallest of a family of fully programmable digital synthesisers, but the sounds it produces are as powerful as those of synthesisers many times its price. The one noticeable compromise is that its keyboard is smaller than standard, but for £150 more you can get the electronically identical CZ-1000 with a full-size keyboard.

One particular attraction of the CZ-101 for the computer user is that it is "multi-timbral". What this means is that in addition to its normal eight-note polyphonic operation (with each note producing a similar sound at a different pitch), it can also operate as four monophonic synthesisers, each with its own sound, responding to different MIDI channels.

Another synthesiser of interest to the computer user is Siel's £399 Expander 80. This is a synthesiser without a keyboard which can only be driven by MIDI signals.

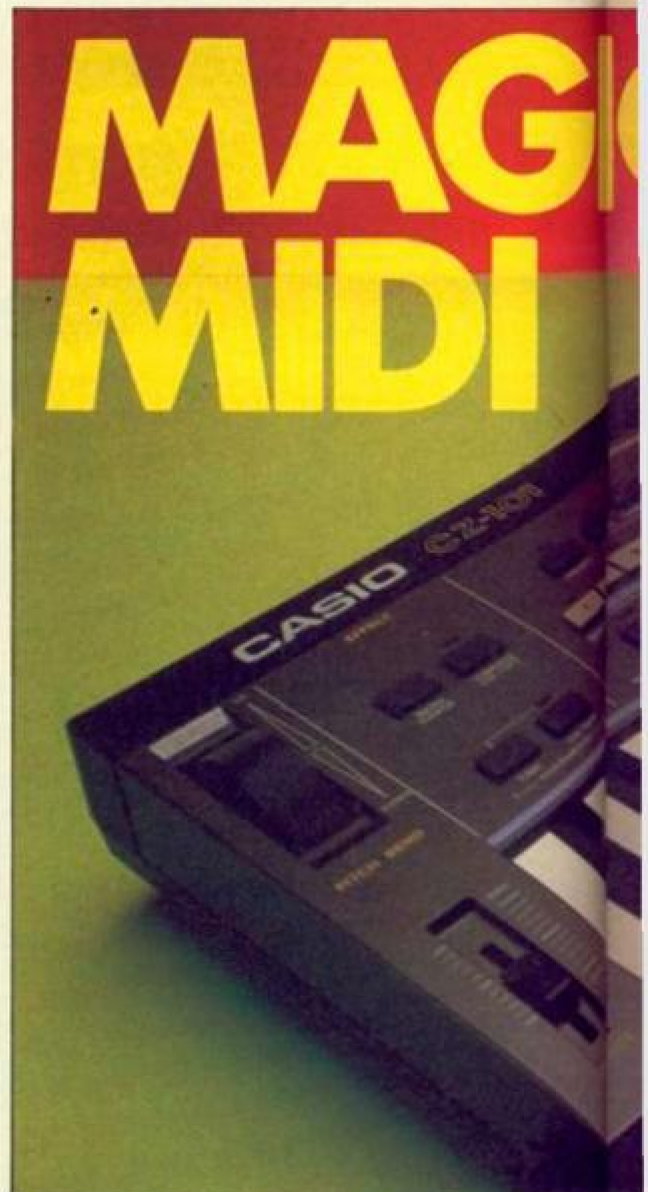
Siel have also just introduced a range of keyboard instruments with preset voices, designed for connection to computers. The smallest of these, the £169 MK370 includes a non-standard interface to link it to the Commodore 64/128 computers. The more powerful £250 MK490 and £325 MK610 instruments also include RS-232 interfaces. Siel also markets a £26 RS-232-to-MIDI converter.

If your budget is big enough, you might look at the recently-introduced DX21 synthesiser from Yamaha. This is a £699 brother for the £1,299 DX-7 synthesiser.

Once you have a synthesiser, the next MIDI instrument on your shopping list will probably be a drum machine. Yamaha could help here as well with its £250 RX-21, a rhythmic companion for the DX-21. Although it has fewer drum sounds and facilities than most other drum machines it is also less than half the price.

Even if you play an instrument other than a keyboard, MIDI can still help you. For example, there are several devices for converting a guitarist's actions into MIDI signals although, at present, these cost well over £1,000.

More affordable is an ingenious Canadian development called the Pitchrider which analyses musical sounds such as those produced by the human voice or woodwind instruments and translates these into MIDI codes. This device, expected to retail for around £200, could open up the world of MIDI to musicians who have previously felt excluded because their instruments operate without an electrical supply.



IF – OR, IN the case of Spectrum owners, when — you tire of the music-making capabilities of your micro's internal sound system, don't despair. There are still two avenues you can explore with your micro to extend your musical horizons.

The first of these is to hook an external sound-making device onto your micro. The second is to use the computer's memory to store a digitised version of a real sound which can later be regurgitated in a more-or-less musical fashion. This is known as sampling.

The former option can be divided further into dedicated micro add-ons such as Acorn's Music 500, Siel's Sound Buggy and Commodore's Music Expander and the stand-alone music synthesisers and electronic percussion instruments, commonly known as drum machines, that are a vital ingredient in much of today's music.

The modern synthesiser or drum machine is essentially a computer dedicated to making musical sounds. All that is needed to allow your computer to converse with an electronic instrument is an interface and communication protocol. This exists in the form of the Musical Instrument Digital Interface — MIDI, for short.

MIDI emerged a few years ago when musical instrument manufacturers got together to draw up a standard way for their instruments to talk to one another. As we explained last year — *Your Computer*, September 1984 — MIDI is a serial link operating at 31.25kBaud — more than 60 per cent faster than the RS-232 — along which digitised information about the operations of electronic instruments is transmitted.

At its most basic level, this data defines which notes are being played, when they start and stop, and, sometimes, other factors such as the force with which they are struck and held down. These last two parameters — velocity and pressure sensitivity — can be used by some synthesisers to modify the sound produced thus giving the player more musical expression.

MIDI can also be used to transmit information about the parameter values used to define particular sounds or "voices".

MIDI information is transmitted on up to 16 software "channels" each controlling one or more instruments. This allows complex multi-part musical arrangements to be performed in real time.

Physically, MIDI manifests itself as two or more five-pin DIN sockets without which the modern electronic musical instrument would be incomplete. Separate MIDI In and Out sockets are used to transfer data to and from an instrument, and many instruments have a third, Thru, socket which passes the information fed into the In socket on to other instruments.

Most musicians probably either ignore the MIDI sockets or use them only to link one synthesiser with others. MIDI allows synths with differing or complementary voices to be linked together and played simultaneously from a single keyboard, thus providing a fuller, more interesting sound.

But MIDI also opens up exciting possibilities for linking electronic instruments with computers. Using a simple interface costing as little as £20 and suitable software, your computer can start to talk to synthesisers and drum machines. The resulting conversations can be mind-blowing.

Already there are more than 20 MIDI packages on the UK market and the numbers are growing by the month. Software writers have so far concentrated on the Spectrum, BBC and particularly the Commodore 64 machines, but Amstrad and MSX owners will soon be able to experiment with MIDI when interfaces become available for their machines.

To date, most MIDI software packages have fallen into one of three categories; real-time recording; step-time recording; and voice editing and storage for specific synthesisers.

In all cases the hardware set-up is similar. A MIDI interface is plugged into the appropriate orifice of the micro and is, in turn, connected to a "master" electronic instrument by a pair of DIN leads, one for each direction of MIDI data flow.

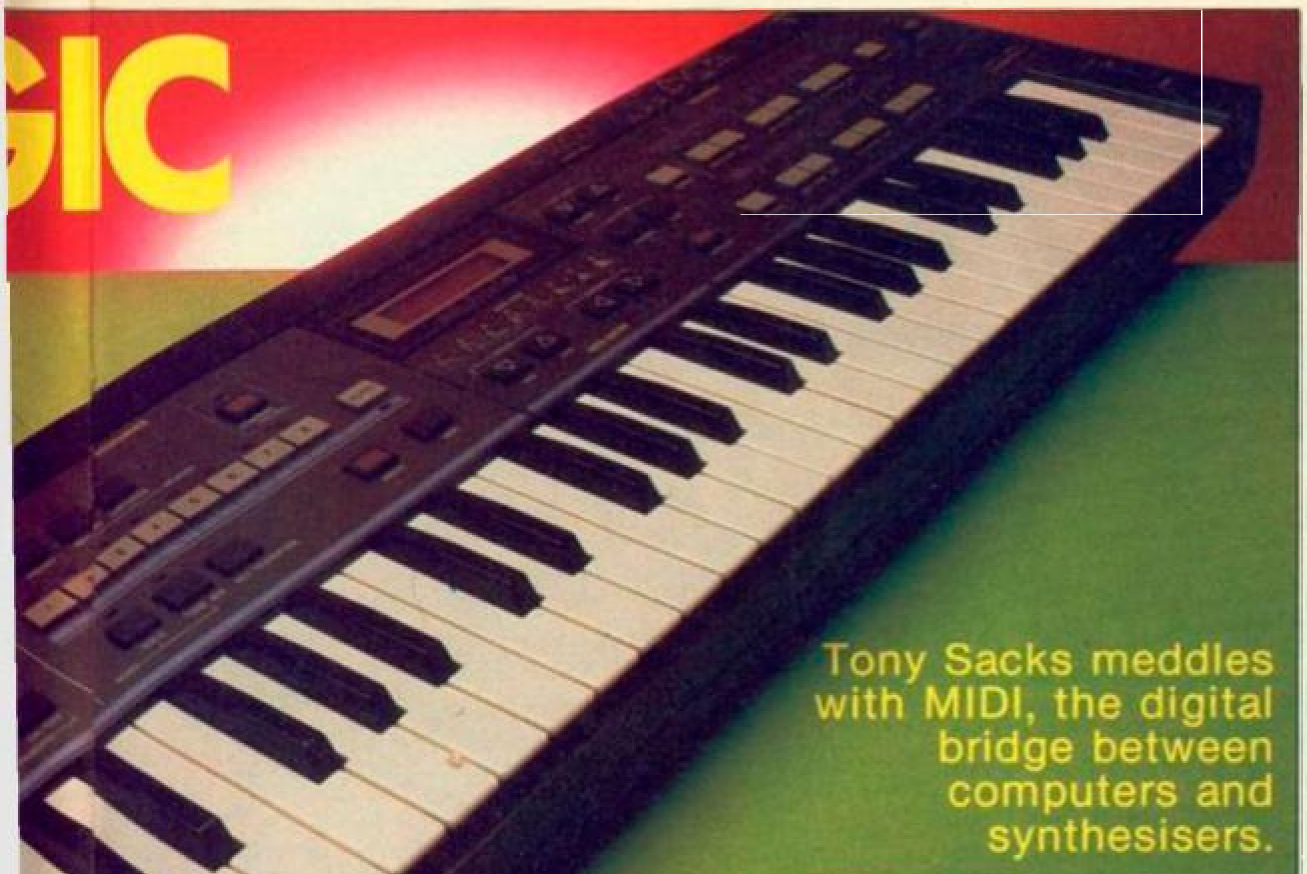
In real-time recording, the micro is used to

MIDI Sophistication from Joreth.



GIC

Tony Sacks meddles with MIDI, the digital bridge between computers and synthesisers.





Casio's CZ-101, above, is a cheap way into MIDI. The MIDI beat; right: XRI's Micon, top left; Siel's interface top right; Micro Musical's Musician, centre; and the Passport interface from Rittor, bottom

simulate the operations of a tape-recorder — usually multi-track — except that instead of audio signals, MIDI information is recorded.

As the instrument is played, it transmits a stream of MIDI data which can be stored on one "track" of the simulated recorder. This track can then be "played back", retransmitting the MIDI signals to drive the same — or other — synthesisers while the musician records accompaniments on other tracks. Software packages with up to 16 such tracks are available.

Each track can be assigned to a different MIDI channel and can thus play separate parts on up to 16 instruments or groups of instruments simultaneously. Although it is dangerous to take the tape recorder analogy too far, it is worth remembering that a 16-channel tape machine could cost tens of thousands of pounds and still not offer all the editing facilities of a good MIDI real-time recorder.

For example, some real-time recorders offer a facility unique to MIDI, known as "autocorrect" or "quantisation". What this does is that if, after recording a track, a musician feels that the timing of some of the notes played was not quite right, the MIDI software can be used to shift all the offending notes automatically so that the timing becomes spot-on.

The second type of package, the step-time recorder, again stores MIDI information, but not in real time. In this case, information about the pitch and timing of each note is specified separately, either from the Qwerty or musical keyboard. A major attraction of the step-time package is that it allows the user to compose and edit pieces that would normally be beyond their technical ability on the musical keyboard.

The third type of package is designed to make the programming of synthesisers sounds easier. On some synthesisers more than 100 parameters have to be specified when programming a sound.

To cut costs, synthesiser manufacturers often build just one multi-function variable control into an instrument. This is used in conjunction with a digital read-out to alter a single parameter at a time, a time-consuming and often confusing process.

However, if the parameter values are MIDI-encoded and sent to a computer running the appropriate software, almost all of the variables can be displayed simultaneously and graphically on the computer's screen, and adjusted using the computer's keyboard, making the programming process much easier. There are software packages designed to do this for several popular sythesisers.

A variation on this theme is to use the micro to build up a "library" of parameters defining various voices. A synthesiser's limited internal voice memory can usually only be expanded using expensive plug-in Ram packs. MIDI offers musicians the much cheaper option of storing their voice data on floppy discs or data cassettes via a micro.

In addition to the three main program types, other micro applications for MIDI are emerging. The Italian Siel company, for example, has developed a digital delay program which takes in MIDI information and spews it out again after a predetermined period to produce echoes and similar effects.

A graphic example of the possibilities opened up by MIDI comes from Electromusic Research (EMR), the most prolific British producer of MIDI software and hardware. EMR's £24.95 Vu-Music package for the BBC interprets MIDI data visually in the form of a kaleidoscopic display on the computer screen.

Pressure of space does not allow us to examine individual MIDI packages but there are some general points to bear in mind when looking at MIDI packages for micros.

First there is a confusing bit of MIDI terminology. The capacity of most MIDI recorders is specified in "events" rather than "notes". In MIDI, switching a note on is one event, switching it off is another. So a recorder with a 24,000 event capacity will only record a maximum of 12,000 notes.

But, if you are also recording extra information such as velocity and pressure sensitivity, the note storage capacity is cut back further. More valuable memory is eaten up if you store information which will tell the synthesiser to change voices at certain points in a composition.

The design of any MIDI recorder program is thus a compromise between the amount of memory available for event storage and the facilities offered by the program. The screen displays tend, therefore, to be rather rudimentary compared to games software. Every byte counts.

Another point to watch for in multi-track recorders is whether there is a fixed amount of memory allocated to each track or whether the memory is divided according to the number of tracks being used and the number of notes in each.

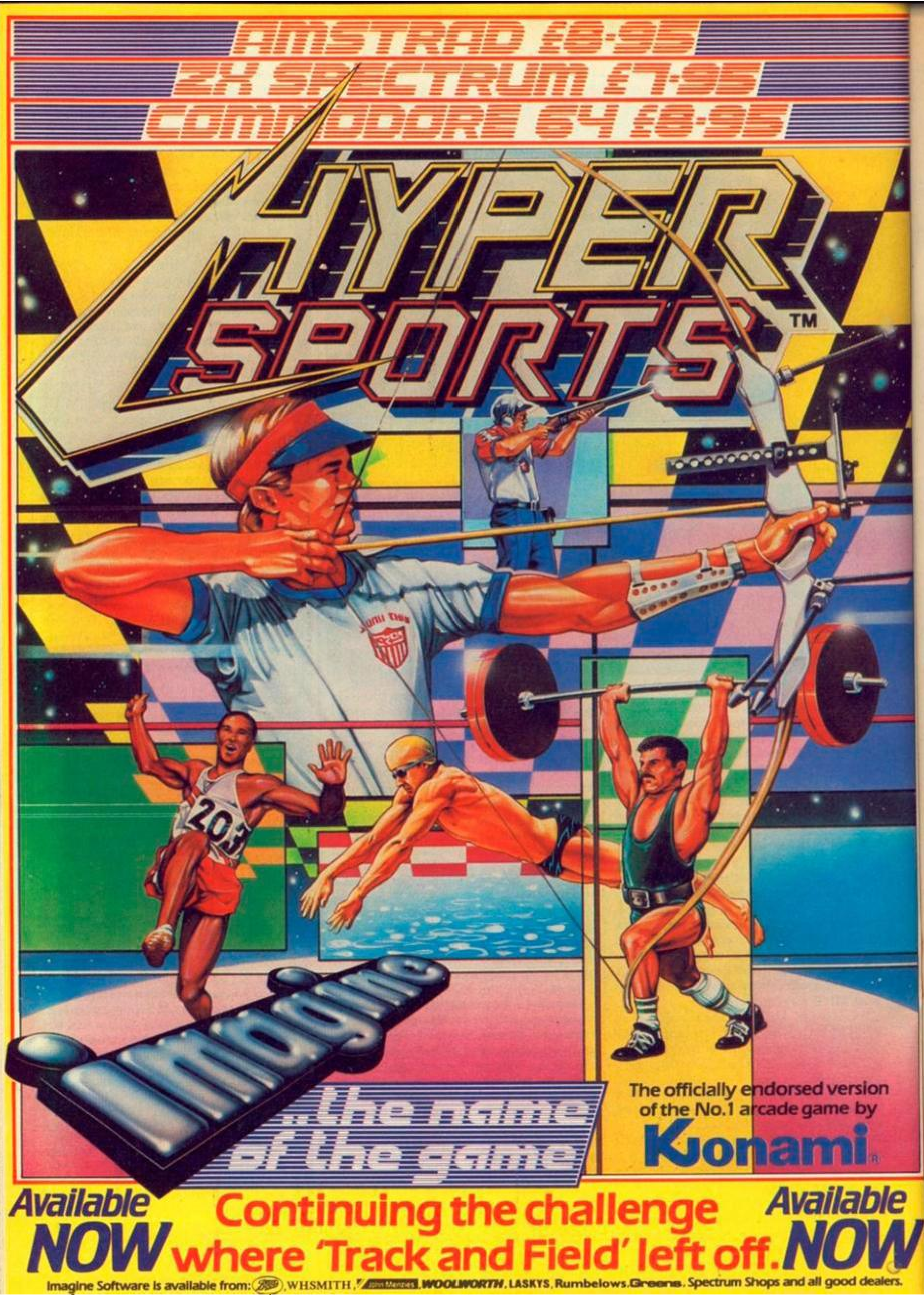
You may have noticed that MIDI hardware and software tends to be rather more expensive than other home micro packages. This is partly because there is not yet a mass-market for MIDI packages, and partly because many existing buyers are professional musicians who are prepared to pay extra for what are, to them, tools of their trade.

This price structure is beginning to break down with the entry of companies like Island Logic and Commodore into the market. On the hardware front, for example, there is Commodore's £19.95 MIDI interface. Admittedly, it is more basic than other interfaces but it will meet the needs of most MIDI novices at less than a quarter of the cost of rival products.

There is still, however, a problem with software prices, Commodore's £14.95 Sound Studio and Island's £34.95 TMS represent extremely good value but offer only a few of the facilities included in the up-market MIDI packages.

A more annoying barrier to the wider use of MIDI with micros is that most of the MIDI software now on the market will only operate with a MIDI interface from the same supplier. The suppliers are, in effect, using the interfaces as dongles to deter would-be software pirates.

(continued on page 71)


AMSTRAD £8·95
ZX SPECTRUM £7·95
COMMODORE 64 £8·95
HYPER SPORTS™
Imagine
..the name of the game
The officially endorsed version of the No.1 arcade game by
Konami
Available NOW
Continuing the challenge where 'Track and Field' left off.
Available NOW
Imagine Software is available from: WHSMITH, WOOLWORTH, LASKYS, Rumbelows. Greens. Spectrum Shops and all good dealers.

(continued from page 69)

This leads to the absurd situation that if you like one supplier's real-time recorder but prefer another's step-time recorder you will have to buy two costly interfaces, performing almost identical functions, to run the two packages.

Some suppliers compound the problem by bundling the interface with an item of software which you may not need and selling separate programs which may interest you but which can only be used with the interface which is not available as a separate item.

A final word of advice if you are thinking of buying MIDI software. If at all possible, you should test the software with the synthesisers or drum machines you are planning to use. Trials with similar machines are not good enough because instrument manufacturers have a nasty habit of revising their MIDI firmware without telling anyone.

MIDI has its critics in the music industry. Some would have preferred a faster, parallel link to the serial format. Others feel that the DIN plug is not up to the job. But the present format was chosen because it offers a relatively simple and cheap way of linking instruments with each other and with micros.

Two recent developments in the micro world could help to spread the MIDI gospel. First, the trend towards 128K as the standard home micro Ram capacity could prove extremely important. It will boost event storage capacities and allow software writers to extend the facilities offered by their packages and to enhance screen displays.

But more significant is the arrival of the first general-purpose micro with a built-in MIDI interface, Atari's ST. Atari boss Jack Tramiel's decision to add $10 or $20 to the cost of the ST by including the MIDI interface shows how important he believes MIDI will become.

Next month we will look at the other method for expanding the micro's musical role — sampling. ■

ADDRESSES

Commodore Business Machines, Corby, Northamptonshire NN17 1BR (0536-205252).
EMR (Electromusic Research), 14 Mount Close, Wickford, Essex SS11 8HG (0702-335747).
Hybrid Technology, Unit 3, Robert Davies Court, Nuffield Road, Cambridge CB4 1TP (0223-316910).
Joreth Music, PO Box 20, Evesham, Worcestershire WR11 5EG (0386-831615).
LVL, Scientific House, Bridge Street, Sandicare, Nottingham NG10 5BA (0602-394000).
London Rock Shop, 26 Chalk Farm Road, London NW1 8AG (01-267 7851).
Micro Musical, 37 Wood Lane, Shilton, Coventry CV7 9LA (0203-616760).
Rittor Music Europe, 24 Broomgrove Gardens, Edgware, Middlesex (01-952 5302).
Rosetti, 138-140 Old Street, London EC1V 9BL (01-253 7294).
Sequential Circuits, PO Box 16, 3640 AA Mijdrecht, The Netherlands (02979-6211).
Siel (UK), Ahed Depot, Reigate Road, Hookwood, Horley, Surrey RH6 0AY (0293-776153/4)
XRI Systems, 10 Sunnybank Road, Wylde Green, Sutton Coldfield, West Midlands B73 5RE (021-382 6048).

MIDI MAGIC

Machine	Supplier	Package	Price	Interface	Comments
Spectrum	EMR	Performer	£39.95	£79.90	8-track polyphonic real-time recorder, 7,960 event capacity (with or without velocity), tracks can be merged.
	Micro Musical	MIDI Musician	£69.00	included	Monophonic step-time recorder, based on Romantic Robot's Music Typewriter (included), microdrive convertor.
	Siel	Live Sequencer	£21.30	£87.95	Simple 1-track polyphonic real-time recorder
	XRI Systems	Micon	£108.00	included	2 programs: 8-track monophonic step-time recorder, helpful stave display, up to 2,900 events/track; and simple 1-track polyphonic real-time recorder, auto-correct.
		Real-time Multitracker	£27.95	uses any interface	8-track real-time polyphonic recorder, 9,000 event capacity, over-dubbing.
BBC	EMR	Composer	£44.95		6-track step-time recorder, 5,100 events, dynamic memory allocation, joystick option.
		Performer	£49.95	£79.90	8-track polyphonic real-time recorder, capacity up to 7,960 events, track merging, auto correct.
		Editor	£34.95		Extra editing facilities for Performer, links it with Composer allowing data transfer.
		Vu-Music I	£24.95		Provides graphics display modulated by MIDI data, choice of type of music to be depicted.
	Hybrid Technology	Music 600	—	£129.00	MIDI hardware module for use with Music 500 system or independently, requires £35 Nucleus ROM.
	LVL	—	—	£ 39.95	Interface for use with LVL's keyboard and music ROM.
	London Rock Shop	UMI-2B	£495.00	included	ROM-based 16-track polyphonic real-time and step-time recorder, auto-correct, voice storage for DX7 synth.
	Siel	Multitrack Composer	£36.95	£99.00	6-track monophonic step-time recorder.
CBM-64 /128	Commodore	—	—	£19.95	Simple MIDI interface for use with Commodore packages including Music Studio, Music Expander and Sampler.
	EMR	Performer	£49.95	£79.90	8-track polyphonic real-time recorder, 18,000 event capacity, auto correct, track merge.
	Joreth	Music Composer System	£250.00	included	8-track step-time and real-time recorder, music composition language, auto-correct, score display.
	Rittor	Passport MIDI/4 +	£79.99		4-track polyphonic real-time recorder, 12,000 event capacity, dynamic memory assignment, auto-correct.
		Passport MIDI/8 +	£119.99	£109.99	8-track polyphonic real-time recorder, 12,000 event capacity, dynamic memory assignment, auto-correct, impressive demo pieces.
		Passport MIDI player	£64.99		stores music created on MIDI4 +, real-time graphic display during playback.
	Rosetti	Scorewriter	£340.00	£90.00	ROM-based 12-track real-time recorder, produces detailed score print-out of real-time playing.
		12-track recording studio	£99.95		12-track real-time recorder, 7,600 event capacity, auto-correct, track merge.
	Siel	Multitrack Composer	£36.95		6-track monophonic step-time recorder.
		16-track sequencer	£67.25	£87.95	16-track real-time polyphonic recorder, 9,000 event capacity.
		Digital Echo Delay	£54.35		provides delays of 5-200ms between MIDI In and Out signals, up to 14 "echoes" possible.
	Sequential	Sequential 964	£74.95	£99.00	6-track polyphonic real-time recorder, 8,000 events, auto-correct.
MSX	JVC			£TBA	Software similar to EMR's Performer 8-track real-time recorder (see above).
Amstrad	EMR	—	—	£79.90	Interface supplied with Introduction to MIDI program on cassette.

Richard Taylor improves the Spectrum's sound

THIS PROGRAM adds a further four commands designed to enhance its musical and sound capabilities to Spectrum Basic. They start where Beep left off, providing a Play instruction which allows tunes to be played by just specifying the notes rather than having to labouriously convert them into the numerical form required by Beep. Secondly, the program facilitates the use of tone envelopes whereby the pitch of a sound varies with time to produce the laser sounds and zaps that are all too popular in commercial games. Random "noise" can also be produced and, when used in conjunction with envelopes, can be made to create some convincing effects.

The program occupies about the top 2.5K of memory just below the UDG graphics area. When run the program lowers Ramtop and proceeds to poke the machine code into memory. After a couple of minutes the computer should respond with a message informing you that the data was OK. At that point the machine code can be saved to cassette or Microdrive etc. If, however, you are presented with a message informing you of a data error in a certain line then its necessary to go back to that line and check it against the original, correcting any mistakes as you go, and re-run the program. This process should be repeated until you get the data OK message.

The machine code can be saved to tape using:

SAVE "SOUND EXT"CODE 62683,1885
Remember to VERIFY!
To reload use:
CLEAR 62682: LOAD ""CODE

The new commands are used in a similar fashion to those which are standard except that the commands have to be typed out in full — in either upper or lower case — there's no lazy single key entry system. However, before any of the commands will be accepted by the Spectrum the machine code must be initialised with:

RANDOMIZE USR 62683

This instruction completely resets the program and introduces the new commands to the Spectrum so that when Basic comes across them they'll be accepted without any quibbles. Because of the somewhat obscure manner in which it operates, any errors reported by Interface 1 disconnect the sound commands so that they are no longer part of Basic's vocabulary. To reinitialise use:

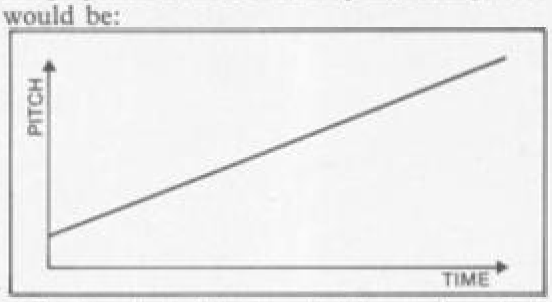
RANDOMIZE USR 62686

The most mundane of the new instructions is *Sound. In its simplest form it can be used as a substitute for Beep. In an analogous manner to Beep the command needs two arguments, the first being the length of the sound (in units of 1/100 of a second — so 300 means three seconds) and the next argument is the pitch of the sound. The pitch is described in a completely different way to that expected by Beep — the smaller the number the higher the pitch! The best way to produce a certain tone is by experimentation — there's no easy method of getting a pitch number for a specific frequency. If the pitch of a sound is made negative then noise is produced with a pitch of very approximately what it would have been if it wasn't negative e.g.

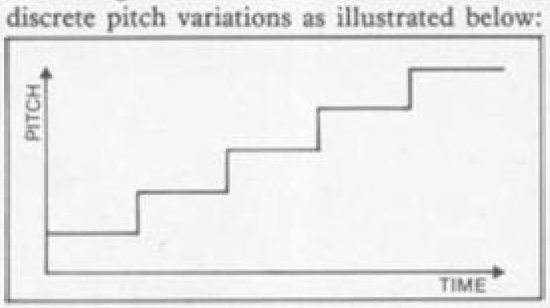
*SOUND 200, – 300

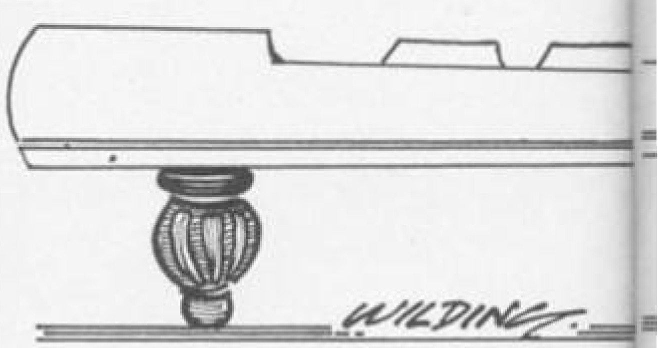
produces noise for two seconds. In fact the sound may not last exactly two seconds, when generating noise the duration you specify is only followed approximately — the sound may last much longer. If this is a problem then you'll have to compensate for it when defining sound lengths.

The *Env command is used to define the envelopes I mentioned. The definition of an envelope describes how the pitch of a sound varies from its initial value as time progresses. These tone changes give rise to the laser/zap effects which were previously unobtainable from Basic without enlisting the help of machine-code routines. A helpful aid in producing envelopes is to illustrate its effect graphically with the aid of a graph. For instance, the graphical form of a steadily increasing note would be:



Notice how the graph shows the pitch undergoing a continuous, smooth change from the intial to the final pitch value. In reality the computer cannot manage this but has to break the change down into a number of small, discrete pitch variations as illustrated below:





You decide how long each individual step wll last and by how much the pitch then "jumps" at the culmination of each of the steps.

Say you wanted to create an envelope similar to the one above, we have to specify three quantities, namely the total number of steps, the size of pitch variation after each of them and the length of each step. From these values the following can be calculated:

Total pitch change =
number of steps x size of step
Total length of env =
number of steps x length of step

Consider that the envelope is to last a total of one second and produce an increase in pitch of 100 units. Because of the weird way in which the pitch is measured an increase is represented by a decreasing pitch number — *Env uses the same method of pitch representation as *Sound. If we wanted to have a total of five steps in the effect then each would have a length of 1/5th second and a step of –20. To define the enyelope:

*ENV 0,5, – 20,20

is used. The first expression after the command is the number of the envelope, in this case 0. Up to 16 completely independent envelopes can be stored in the Spectrum's memory at one time, each one being specified by a number between 0 and 15. The second expression is the number of steps, the third the pitch variation per step and, finally, the 20 is the step length in 1/100th's of a second. Since each step lasts a comparatively lengthy 1/5th second its quite easy to hear the individual steps composing the envelope. To hear the envelope type:

*SOUND – 1,250,0

Notice how a third argument has been tagged onto the end of *Sound to specify the envelope to be used. The length of the sound is given as –1. This means that the envelope should be played only once. Similarly if it was –2 then the envelope would be repeated twice. Try

```
 10 REM  BASIC SOUND EXTENSION
 20 REM    By Richard Taylor
 30 REM        48K Version
 40 REM
 50 CLEAR 62682: LET a=62683
 60 FOR l=0 TO 29
 70 LET t=0: READ v,a$
 80 FOR c=1 TO LEN a$ STEP 2
 90 LET x=CODE a$(c)-48-7*(a$(c
)>="A")
 100 LET y=CODE a$(c+1)-48-7*(a$
(c+1)>="A")
 110 POKE a,16*x+y
 120 LET t=t+PEEK a
 130 LET a=a+1: NEXT c
 140 IF v<>t THEN PRINT "ERROR i
n line ";8000+l*10: STOP
 150 NEXT l
 160 PRINT "Data OK - Now save m
achine code to tape."
 170 STOP
8000 DATA 7192,"CDE8F42A3D5C11FD
F4732372C92138FCAF0610112100771 9
10FC1300087719 10FCC93A3A5CFE0BCA
6CF676FDCB01AEFDCB304EC4CD0E3A3A
5C3CF5210000FD75"
8010 DATA 6380,"37FD7526220B5C21
010022165CCDB016FDCB37AECD6E0DFD
CB02EEF147FE0A3802C607CDEF153E20
D778119113CD0A0CAF113615CD0A0CED
4B455CCD1B1A3E3A"
8020 DATA 5904,"D7FD4E0D0600CD1B
1ACD97103A3A5C3C281DFE092804FE15
2003FD340D0103001170 5C21445CFDCB
0A7E280109EDB8FD360AFFFDCB019E18
0AFD363102CD9517"
8030 DATA 6891,"CDB016AFCD0116CD
2C0FCD171BFDCB007E20143A3A5CFE0B
CA6CF62A595CCDA711FD3600FF18DC2A
595C225D5CCDFB1978B1200DFD360000
CD5D15FD3600FF18"
8040 DATA 9115,"C9DFFE0D28B3FDCB
3046C4AF0DCD6E0D3E19FD964F328C5C
FDCB01FEFD3600FFFD360A01CD8A1BC3
FDF4736F756EE4E2F9706C61F9BEF765
6EF693F665666665"
8050 DATA 6655,"63F41DF7001105F6
DF1AE67F4F7E23FE0D2806FE2030F6F6
20B9200E1A131730E8225D5CEB5E2356
EBE91A131730FB13131AA720D3ED7B3D
5CE12A5D5C225F5C"
8060 DATA 7619,"CDC516FD36000BFD
CB017EC205F5C3B6F521FDF4CD302520
0321A8F5E521761BE5FD3600FFFD3626
002A5D5C2B7EFE2038FAFE2A20BF188D
CD821CCD30252813"
8070 DATA 8063,"CD941EFE10D29F1E
CD11F71138FC19E5360023AFF5E5DFFE
2C2057CD791CDFFE2C2802CF00CD811C
E1CD30252837E5CD941EE1E5232323A7
CA9F1E77CDA22DDA"
8080 DATA 6709,"9F1E00CB78C29F1E
002807792F4F782F4703E1E523712370
CD941EE1A7CA9F1E7723232323F13CFE
0838A9CD3025C8E177C9E1F118F56F26
005D542929292929"
8090 DATA 8384,"19C9CD821CCD3025
2810CD941EFE00D29F1ECD11F7191148
FE19E5DFFE2CC2BEF6CD811CCD3025E1
280FE53600CD941EE1A7CA9F1E7723E5
23AFF5E5DFFE2CC2"
8100 DATA 7829,"0DF7CD791CDFFE2C
C2BEF6CD811CE1CD30252846E5CDD52D
DA40F92004FE103802 3EFFE1E577CDA2
2DDA9F1E08CB78C29F1E0028077 92F4F
782F4703E1E52323"
8110 DATA 7600,"712370CDD52DDA9F
1EF5CB7FC29F1EF12802ED44E1237723
2323F13CFE08389AC306F7CD8C1CCD30
25C8CDF12B78B12002CF0900ED432EFC
ED5330FC21140022"
8120 DATA 7775,"32FC3E033236FCAF
3237FCCD4CF8211EF8CD8D2C3002F620
4F7EA728D4B9201E235E23562A2EFCE5
```



BASIC SOUND EXTENSION

*SOUND –5,250,0

The pitch value given in *Sound is the initial pitch which is decreased down to 150 by the envelope. If an envelope is being repeated then the pitch commences from its initial value at the start of every recital of the envelope. There is nothing to stop noise being enveloped in a similar fashion, try:

*SOUND –5, –250,0

Note that when using enveloped noise the pitch is varied as though the negative sign in front of it didn't exist (although noise is produced), otherwise decreasing –250 by 100 would produce –350 instead of –150 which is what we're after. Enveloped noise is the basis of many of the sound effects to be found in games, especially those of the "space-war" genre. In order to produce a much smoother envelope the step length has to be drastically reduced. Redefine envelope 0 with:

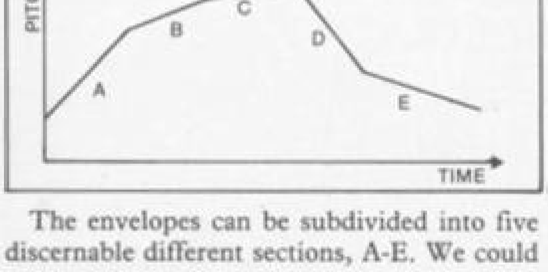
*ENV 0,100, –2,1

If you try

*SOUND –8,250,0

a greatly improved effect will be heard.

So far the envelopes that have been utilised are relatively simple in that they consist of only a single type of pitch change. In reality we may wish to use more complex envelopes such as:



The envelopes can be subdivided into five discernable different sections, A-E. We could define a seperate envelope for each of A-E and play them together using a string of *Sound commands. This method, as well as being unelegant and cumbersome, is further complicated because we need to calculate the value envelope A, say, leaves the pitch at when it terminates so that we know what to use as the starting pitch for envelope B. Thankfully the *Env command allows an envelope to be composed of up to eight individual sections. We could define the above envelope as follow:

*ENV 1,20, –4,2,20, –1,2,10, –1,4,20,4,2,
20,2,2

Each of the five sections are 2/5th second in length, making the whole thing two seconds in duration. Try:

*SOUND –1,300,1

As you can hear such an envelope provides a much more complex sound.

The Beep instruction was designed for playing music rather than making exposion sounds etc. However, life still isn't easy if you're converting music since all the note values have to be converted into the relevant numbers required by the somewhat awkward Beep. The *Play command enables music to be converted without the need for any number crunching. It has a string argument which is used to contain the notes you wish to play and other associated information. Any letter from A to G found is the string played as that particular musical note — so:

*PLAY "abcdefg"

plays all the seven notes available. Of course it would be extremely limiting if you only had seven notes to play with so there is a facility to change octave.

Although the program supports eight octaves those at the extreme levels of pitch are of little use for musical purposes. In fact the upper few notes in the top octave will produce an error if you try to play them for the simple reason that the computer can't manage to produce such a high pitched sound. To change octave an O is simply put in the string followed by the new octave number — 1 to 8. all subsequent notes in that string are then played in the new octave. At the start of every new *Play the octave is reset to 3. To further increase the quantity of notes available sharps are also supported. A sharp note has a pitch slightly above — one semitone in fact; whatever that is — its ordinary value. To play a sharp note simply suffix the note with a hash character (#)

*PLAY "c#"

gives C sharp.

```
10 FOR a=1 TO 7
20 *PLAY "o"+STR$ a+"cc# dd# eff#
   gg# aa# b"
30 NEXT a
```

This short program demonstrates the full scope of the notes available in the lower seven octaves. The O "directive" — or any other directive that needs an argument, you'll meet some more in a moment — must be followed by a number, no variables or expressions are allowed. You can, however, circumvent this difficulty by using STR$ to construct the numerical part of the string — as in the above program — out of an expression, variable or whatever.

You can play noise instead of plain notes by

(continued on page 74)

```
EBCD10F83A2FFC3CE1C07CB5C8CD541F
D27B1B10CEE92323"
8130 DATA 8977,"2310D63A54F83B54
F86142F96242F96342F96442F96542F9
6642F96742F979BAF86EAAF86F9AF86C
D0F87009F8702CFA002A30FC7ECD6BF8
D02A30FC232230FC"
8140 DATA 9056,"ED4B2EFC78B1CACC
F700BED432EFC10E4FE21D0FE10D8FE18
3FD823ED4B2EFC78B1CACCF70BED432E
FC2230FC37C9CD00F947A7C82142052B
7CB520FB10F6C9CD"
8150 DATA 8578,"00F9A7CA6C04FE09
D26C043236FCC9CD00F9FE02D26C0421
37FCCB86B677C9CD00F9FE11307FFE10
20023EFF322DFC2137FCCBCEC92A30FC
E52A2EFCE5CD54F8"
8160 DATA 6969,"C1E1FE2D20072230
FCED432EFCF5CD00F9A728516F2600F1
FE2D20057DED446F252232FCC9CD54F8
CD1B2DDACCF7210000CD1B2D38292938
2C5D542938272938"
8170 DATA 7190,"24193821D6305F16
00193819E52A2EFC7CB52806CD54F8E1
18D72B222EFCE17CA7200027DC9CF0AD6
633002C60787F52A32FC2234FC2A2EFC
7CB5283CCD54F8FE"
8180 DATA 7529,"232000DF13CF52A2E
FC7CB52825CD54F8FE2E20242A34FCCB
7CC2CCF75D54CB2CCB1D192234FC2A2E
FC7CB52805CD54F8180621FFFF222EFC
F1076F260011 0DFC"
8190 DATA 6722,"195E2356EBCDB433
2A655C11FBFF193A36FCD6038677EF34
0043559F800105343571033 8CD991EED
5B34FC2137FC3EFFCB4E20033A2DFCCB
46280908792F4F78"
8200 DATA 7277,"2F470300C365FACD
7A1CDFFE2C2011CD811CCD3025C8CD94
1EFE10D29F1E1806CD3025C83EFFF5CD
A22DDA9F1E00CB78C29F1E002807792F
4F782F4703C5CDD5"
8210 DATA 7314,"2D5F1600DA6C0428
04ED445F15C1F118B3CD00F9FE08D240
F9CD11F7191148FE197EA7C84723C5E5
4623C5E54E235ECB039FCB0B5779234E
2346CD65FAE12323"
8220 DATA 7511,"2323C110E5E1C110
DDC9DD2137FCDDCB00BEDDCB00B66FCB
7A2800BDDCB00FE7A2F577B2F5F13CB78
2800DDCB00F6792F4F782F47037DDDA6
00173002CF09CB7D"
8230 DATA 8890,"2039D5C57DCD11F7
1138FC197EA723E5DDE1E1D1202547 3A
37FC173E0130017BF5C5D5E521000022
2BFCE1E5DDE5CDDAFADDE1E1D1C1F13D
20E6C96960 1874ED"
8240 DATA 7652,"5329FCC5DD4600DD
5E01DD5602DD4E03C5D5E5591600CD4E
FBCD541FD27B1BE1D1D5CB7A20031918
0A7A2F577B2F5F13B7ED52DA40F91130
75ED5219D240F9D1"
8250 DATA 8423,"C1D53A37FC17381D
E52A2BFC7806000947300 4E1E1E1C9ED
5B29FCB7ED521930F2222BFCE1D110A8
C1D51104000D19D11091C97CB5C87AB3
C8DDE5CDBEFB3A37"
8260 DATA 7807,"FCCB772006CDB503
DDE1C9F33A485CE6380F0F0FF6084FD5
DDE1CB3CCB1DCB3CCB1DCB3CCB1DE5ED
5FCB77CBB75F160020 0ACB2319300E21
FFFF1009CB23ED52"
8270 DATA 6992,"3003210000231 32B
7CB520FAE179EE104FD3FECB6720CFDD
7CDDB5DD2B20C7FBDDE1C9E5E5424B21
171100B7 0B1032817EBDD2E1021000007C
298FCB11CB103003"
8280 DATA 5837,"19CE00DD2D20F14D
44DD2E18E1111E0019EB21000037CB11
CB1017ED6AED523000119DD2D20F0CB11
CB10792F5F782F57E1C96E0473047804
7D0482048204870 4"
8290 DATA 1100,"8C04910496049B04
A004A504A50400000000000000000000
0000000000"
```

(continued from page 73)

utilising the n directive, n0 turns noise off while n1 switches it on. To hear the effect try the above program with n1 preceding the 0 in the string.

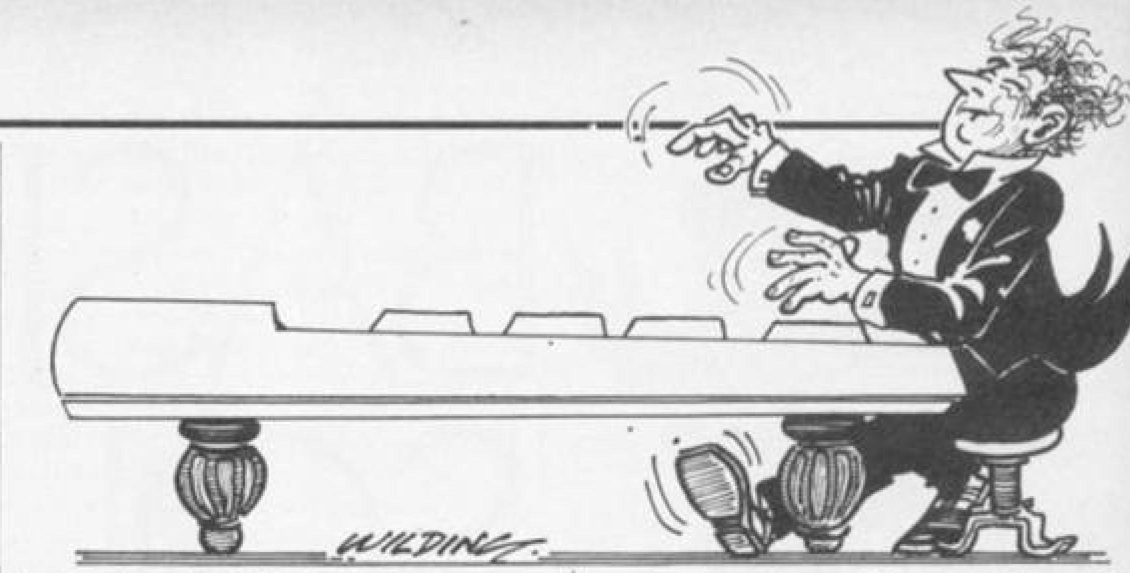
The pause (p) directive enables a silent gap, equivalent to a musical "rest" to be placed in a tune. The number following p is the length of the pause measured in 1/100ths of a second. The pause can be up to 2.55 seconds.

It is possible to modify the duration of each note using the L directive. The L is succeeded by a number between 1-255 representing the new length, in 1/100ths of a second, of each note. At the start of each new *Play command the note length is reset to 0.2 seconds. Dotted notes are also supported by the program. A dotted note is played for 1.5 times longer than an ordinary note. To make a dotted note simply put a full stop after the letter in much the same way as you would with a #.

*PLAY "L100c#."

plays c# for 1.5 seconds. If you require a dotted sharp note then the full stop should come after the #.

To add a little more interest to a tune it is possible to use an envelope. So far all the notes have kept the same tone value throughout their duration, like the sound produced by Beep. To turn envelopes on a Y directive is used. The number following the Y is the envelope you wish to use, or 16 to turn envelopes off. All subsequent notes are played using that envelope. By experimenting with a number of different envelope effects it is often possible to enhance the sound of a tune considerably from its flat, unenveloped beginnings.



To summarise these are the directives available in a *Play string — actually, there is still one to come — I'll mention that one soon.

A-G	=	The notes.
#	=	If placed after a note will make it a sharp.
.	=	If placed after a note will play it 1.5 times longer.
On	=	Lets you play subsequent notes in octave n.
Pn	=	Pauses for n 1/100ths of a second.
Nn	=	If n = 0 then noise is turned off. If n = 1 then its switched on.
Ln	=	Makes the duration of subsequent notes n 1/100ths of a second.
Yn	=	Makes following notes to be played in envelope n (or normal if n = 16).

If a certain sequence of sound commands are always used together then they can be made into a single unit called an effect. An effect is a construction of up to eight separate "sounds" strung together. Like envelopes, effects can be defined and stored in the Spectrum's memory for later, and repeated, use. You can have up to eight effects defined at any one time.

*EFFECT 0,1,100,200,16,100,150,16

This effect is equivalent to

*SOUND 100,200:*SOUND 100,150

The first value in an *Effect is the effect (0-7) and the next is the number of times the whole effect is to be repeated when used. Every block of three expressions from there onwards represents one of the maximum eight individual sounds that compose the effect. They are given in the same format as that expected by *Sound, i.e. length, pitch and then envelope number.

In an effect sequence it is mandatory to specify an envelope number, it cannot simply be left off. If no envelope is required then "16" should be specified. The only way to play an effect is by using the *Play command. An X directive, followed by an effect number, will sound the appropriate effect. ■

Listing 1.

```
10 N=100:P=49152:GOSUB 50
20 N=57:P=12288:GOSUB 50:END
50 PRINT"PLEASE WAIT  [  ]"
60 Z=48:X=1:C=9:V=7:B=16
70 READZ$:IFZ$="*"THEN RETURN
80 PRINT"TAB(14)"  "TAB(14)RIGHT$(STR$(N),LEN(STR$(N))-1)
90 Q=0:FORT=1TO4STEP2:X$=MID$(Z$,T,2):GOSUB130:POKEP,L:P=P+X:Q=Q+L:NEXTT
100 X$=MID$(Z$,49,2):GOSUB130:CK=L:X$=RIGHT$(Z$,2):GOSUB130:CK=CK+L*256
110 IFCK<>QTHENPRINT"DATA ERROR IN LINE"PEEK(63)+256*PEEK(64):END
120 N=N-X:GOTO70
130 G=ASC(X$)-Z:H=ASC(RIGHT$(X$,X))-Z:L=H+(H>C)*V+B*(G+(G>C)*V):RETURN
200 DATA 4C5FC5CAAD1690C90FF054CE1204AD1204C9300D4AA9398DF20A
210 DATA 1204CE1104AD1104C93D0D3
[illegible]
```

TOWER OF ANTICS

WELCOME TO the Tower of the Antics. Here is a fast and smooth arcade-style game, written in machine-code, for the Commodore 64. It utilises multicoloured sprite graphics, and the smooth action is due to the raster interupt which displays the sprites 50 times a second, so no flicker.

You are Willy and you find yourself at the bottom of a tall, dark tower — the Tower of the Antics — named after the strange assortment of creatures which inhabit its depths. Regardless of how you got there, you decide to make your way to the top in search of an exit. However, your route is blocked by moving holes in the platforms which speed up after the sixth level, and the Antics themselves, who multiply, the higher you go. Don't get too disheartened, Willy is quite an agile little man, and can jump over the Antics and the holes with a bit of practice.

On your journey to the top, you will meet an assortment of weird and wonderful creatures. The green Wirrly Birrd is the most dangerous, as it flies all over the screen in order to catch you. All the others — Trumbles — furry creatures with big ears, snakes, mutant chinese teapots and strange, blue, dog-like creatures — Mugdags — move along the platforms, occasionally jumping through the moving holes to get you. Each Antic has its own peculiar way of moving — e.g. the teapot waves its lid up and down, and waggles its spout.

Reach for the top

To reach the top of each screen you must guide Willy out of the lift at the bottom of the screen, and into the lift at the top of the screen. If an Antic catches you, you will be thrown to the bottom of the screen and you will lose one life, of which you have three. If you fall through a hole, you will be dazed for a couple of seconds, allowing the Antics to get closer.

Meanwhile, your oxygen supply is running out and, when it runs out, Willy will die three deaths all at once. He will though, collect a bonus on completion of each screen which depends on the amount of oxygen Willy has left, and the number of screens so far completed. There are three transporters on each side of the screen which Willy can use to take him to the other side. When the Antics reach the bottom of the screen, they go up the elevator on the right of each screen to attack you again.

There is a Top 10 high score table to record the best scores. 120,000 is a good score. To see the table press f7 or wait until it comes up automatically.

Now to the process of typing the game in. There are two programs. The first includes all the sprite and machine-code data, as well as a check routine. Both programs should be typed in and saved. From now on, every time you want to load the first program, and following must be entered directly after switching on:

POKE 642,64:POKE 44,64:POKE 46,120:
POKE 48,120:POKE 16384,0

This raises the bottom of memory available to Basic to avoid it overwriting the sprite data.

Listing 2.

```
[illegible]
```

```
AC98C00TE200TC8A9200D04D4CB0C
950 DATA A00684C92F00034C43C1C93
A90034C43C1AD0094C92F0003FD00
960 DATA 4C43C1C93A90034C43C14C0
9C5A9200D04D4A5C600D2C9000200
970 DATA 0AC0A9000D00TCA0460C01D
48C00D4EC017ACE010A92100AD0A
980 DATA 04D4200TC0A9200D04D400C
82E00C2A9000D00TCA8CT0D02T000
990 DATA C900DAC0A2192007C0A9018
0007F200TC0A8C000007FCAD0EF00
1000 DATA CDA9C000D02C900DAC0A900
0009004C09C5A9200D04D4A9C6440C
1010 DATA 0D02C900DAC0A9000D00TC
10A9FFCD01D00D010400004EE9000
1020 DATA 017ACE0100A9210D040420
0TC0A92000D04AD01D0C90C90E000
1030 DATA DAA9CT0D02C900DAC0A900
0D00TC0D0D04A9140D0TD40D00DC0A
1040 DATA D4A9210D00D4A920AC1090
0D1304CE1090A2192007C0A9014T0A
1050 DATA 0D007F200TC0A9C000007F
CAD0EDAD1190C903F000C900F0030C
1060 DATA 0TAD1090C900D0034CT2C0
A9C00D02C900DAC0A9000D0990660A
1070 DATA 4C09C5A9E10D007AA90F0D
1690A9000D00TCA21100 4FC99D1F00
1080 DATA F904CA10FTA2FFEE2T00EE
2100EE2000200TC0CA00F1A900C40C
1090 DATA 0D210000200DAE01D00E01
TA200TC0CAD0FTA9640D1190 4C3A0C
1100 DATA 43C1EAA90F0D1690A9000D
00TEAD1190C9060000CA2130D221C0A
1110 DATA C99DFT04CA10FT4C9DC0A2
```

```
100D36C99DF504CA10FTA2FFEE4F0E
1120 DATA 27D0EE1200EE11D0EE10D0
EE0FD0200TC0CAD0EB4C43C1EE530E
1130 DATA 0590EC0690A21EA06400D0
FDCAD0F0AE0590AC0690E0CAEA100D
1140 DATA 4C09C5230F3C3264A15A01
9C01C861FFA132610065016565C30A
1150 DATA 656502650165000FF020000
00000000000000020405070T0004C302
1160 DATA 0A0DC3D2C0CAD0ECC0D0C2
D3C9C0D1CFC0D1000000101FF00D70D
1170 DATA 0100FF0001000FF0001000C
0F20200F10190T050E20200C050903
1180 DATA 061420212121140F0F2000
010E1920020F0E0513200212 0F0E01
1190 DATA 00050E20212121100F1520
2000010405202001420202121140 2
1200 DATA 21FF000000000000000000 2001
000000000000000000000000000000
1210 DATA *
2000 DATA 0000000002A00002A0000 3A
00002A00000200000000000000000001
2010 DATA 00150000154000054500054
100114101514400014000014002002
2020 DATA 0014000011T0001 0T000F0
3000F0000100000000002A00002AT A03
2030 DATA 00003A00002A0000 300000
000000000000150000554000054A01
2040 DATA 500054100114140 1140401
14000414000055000045000043000 2
2050 DATA 0003C30003CF0001000000
0000000000000000AC00000A00000004
2060 DATA 2C00002000002000005400
0154000015000041500041440001A101
```

```
2070 DATA 1454001400001400001400
0D4400D04000C0F00000F00013101
2080 DATA 0000000000A00000A00000AC
0000A00000 2C00002000002000 1003
2090 DATA 0054000155000515000415
0014144010144000144000 14102102
2100 DATA 0055000051000 0C10000C3
C000F3C0010000 06C010050 4540000
2110 DATA 5405554005554005147000
5A0010 0A00000000000000000000C04
2120 DATA 00000000000000000000000
000000000000000000000000000000
2130 DATA 00000000000000001000000
0A00000A00000A00000A00000A102
2140 DATA A00000200000200005400
015500015500055401454501 04A03
2150 DATA 54100054000155000545 40
0545403501703C00F00C00C001C104
2160 DATA 00000000000000000000000
00000000000000 C00303C003C0400
2170 DATA 34005C05014005454 00155
00005400005 4000155000555404E03
2180 DATA 1054105020144 0A00400A0
0000A000001000000000000003503
2190 DATA 00000000000000000000000
00000000000000000000000545400
2200 DATA 0001550001554005554005
5540055540145450542054 44A02605
2210 DATA 443CA0F03CA0F00100000 0
0000000000000000000000000C003
2220 DATA 0000000000000000000020000
0A02A0002EC00DAAEC00AAAA02A2CE6
2230 DATA AAA0A9AAA0A9AAA9AAA2AAAA0
2AFFA00A0EA002AA00002000015400
```

```
2240 DATA 0000000000000000000000
000000000000000000000000000000
2250 DATA 0000000200000A02A000AA
C00AAAA02AAAAAAAAA6AAAA6AA0F09
2260 DATA 2AAAA02AFFA00AAAA002AA
0000200001000000000000000FE05
2270 DATA 0000000000000000000000
0000000000100000540 5055151301
2280 DATA 40055554545551 1055000
4150009044400090620400220440 3306
2290 DATA 1104101114504401000000
000000000000000000000000DF00
2300 DATA 0000000000000000000000
0005001015415455549555 5055F702
2310 DATA 5550045550500044402244
00222000044000111001455001 5A04
2320 DATA 0000000000000000000000
0000000000000000000000000000000
2330 DATA 000004005016015 4551555
5745551505550 4055100111000 0903
2340 DATA 0906200002104401104404
1011051401000000000000000002102
2350 DATA 000000000000000000000000
0000000000000000500041 54C500
2360 DATA 0415551505555605555505
5517911005110000000000 1103304
2370 DATA 00044400005514001000000
0000000000000000000000000DF00
2380 DATA 0000000000000000000000
100000CA00002A00000 2002 4025401
2390 DATA 00A0000A000000000000000
02000002000000220000 0AA0001A406
2400 DATA 0000000000000000000000
000000000000000000000000000000
```

```
2410 DATA 000000000000000A0000202
000202000202000200000000003602
2420 DATA 0000A40200A01A0020CA00
002000000100000000000000000A603
2430 DATA 0000000000000000000000
000000000000000000023000000AD00
2440 DATA 0000020000AA0000020023
AA0222FFE22AAAA20AAAA002AADE00
2450 DATA A000AA00003F0001000000
000000000000000000000000000A02
2460 DATA 0000000000000000000000
00000020000000C0000AA00200601
2470 DATA 2A0023AA0222FFE22AAAA2
0AAAA002AAA000AA00003F00013C09
2480 DATA 000000AA00002820000000
0200000200000220000200000A002
2490 DATA 2020000AAAAAAAAAAA00299
0002AA0002AA0002 0C0000AA003300
2500 DATA 0020000000000000000000
0000000001000000000000000002900
2510 DATA 0000000000000000280000
AA0002AA000AC6A02AAAA022AA5605
2520 DATA 00A20EC0000AAAA0020020 0
0002200000000000020200020200 6
2530 DATA 0000000000000000000000
000000000000000000000000000000
2540 DATA 0000000000000000000000
000000000000000000000000000000
2550 DATA 0000000000000000000000
000000000000000000000000000000
2560 DATA 000000000000FF0000000
0000000000000000000000000000FF00
2570 DATA *
```



David Swinnerton with a smooth and colourful program for the CBM-64 utilising sprites.

Listing 1 can now be loaded and run in the usual way. Listing 2 can now be loaded and run, and the game is ready. I suggest that listing 1 is saved just before listing 2 so that no swapping of tapes is needed. Every time you wish to play the game, the line of pokes must first be typed in. Then both programs can be loaded and run in quick succession.

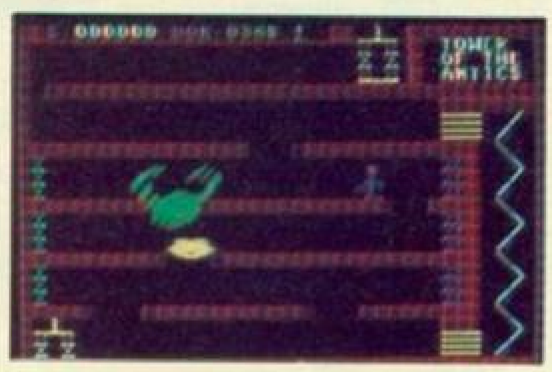
To play the game, a joystick is needed in Port 1. The directions are:

pressing left	—	move Willy left
pressing right	—	move Willy right
pressing up	—	makes Willy jump over hole or an Antic
pressing Fire	—	makes Willy jump up to new level

Obviously, pressing up and left at the same time results in Willy doing a running jump to the left, a very handy manoeuvre.

If you don't relish the thought of typing the game in yourself, then send £3.50 to David Swinnerton, 15 Bifrons Rd, Bekesbourne, Kent CT4 5DE. I will send you a fast loading version of Tower of the Antics on one side of the tape, and my other game, Auto 64 — see June issue — on the other side. ■






```
)+CHR$(0)):POKE1827+T,A:NEXT
740 RETURN
750 REM ====== HI-SCORE SCREEN =
======
760 N=0:PRINT"           TOWER
 OF THE ANTICS"
770 PRINT"
"
780 PRINT"              HI-SCORE
TABLE":PRINT"
"
790 FORT=1TO10:PRINTTAB(7);" "H$
(T);TAB(22);" "H(T):NEXT
800 N=N+1:PRINT"
             PRESS FIRE TO P
LAY       "
810 FORT=1TO40:IFPEEK(203)=60ORN
=10THEN190:REM RETURN
820 NEXT:PRINT"

      "
830 FORT=1TO40:IFPEEK(203)<>60TH
ENNEXT:GOTO800
840 GOTO190
850 REM========== TITLE SCREEN ==
=======
```

```
860 POKE53281,0:POKE53280,0
870 PRINT"                    T O
W E R                    O F
880 PRINT"
 T H E"
890 PRINT"
900 PRINT"
910 PRINT"
920 PRINT"
930 PRINT"
940 PRINT"
950 PRINT"
960 PRINT"
970 PRINT"
980 PRINT"            (C)1985 DAV
ID SWINNERTON"
990 PRINT"              FOR  YOU
```

```
R COMPUTER "
1000 PRINT"                 HI-SCOR
E="HI$
1010 PRINT"                  SCORE
="SC$
1020 RETURN
1030 REM========= BONUS SCREEN =
=======
1040 PRINT"
WELL DONE"
1050 PRINT"        YOU COLLECTED A
 BONUS OF "B0$
1060 PRINT"            YOUR SCORE I
S NOW "SC$:LE=LE+1:LA=LE:IFLA>6T
HENLA=6
1070 PRINT"               ENTER LE
VEL"LE:IFPEEK(36882)=1THEN80TO10
90
1080 IFLE>6THENPOKE36882,PEEK(36
882)-1:LA=6
1090 FORT=1TO15STEP2:POKEV+T,178
:NEXT:POKEV,78:POKEV+2,150:POKEV
+4,100
1100 POKEV+6,130:POKEV+8,160:POK
EV+10,190:POKEV+12,220:POKEV+14,
250:POKEV+3,200
```

```
1110 POKEV+21,255:POKEV+16,0:POK
EV+24,15:POKES+5,10:POKES+6,20
1120 FORT=1TO10:POKES+4,32:POKES
+1,N0(T):POKES,N0(T)
1130 POKES+4,33:FORR=1TO250:NEXT
R,T
1140 FORT=0TO500:NEXT:POKES+4,32
:POKES+1,225:POKES,143:POKES+4,3
3
1150 FORT=1TO000:NEXT:POKES+4,32
:POKES,0:POKES+1,0:POKEV+21,0:GO
TO250
1160 REM======== LEVEL DATA ====
=======
1170 DATA 6,8,10,12,14,15
1180 REM======= MUSIC DATA ====
=======
1190 DATA 8,12,10,8,16,14,22,18,
0,0
1200 REM====== VELOCITY DATA ===
=======
1210 DATA 0,0,1,1,255,0,1,0,255,
0,1,0,255,0,1,0
1220 REM====== POSITION DATA ===
=======
1230 DATA 35,223,60,50,100,161,9
```

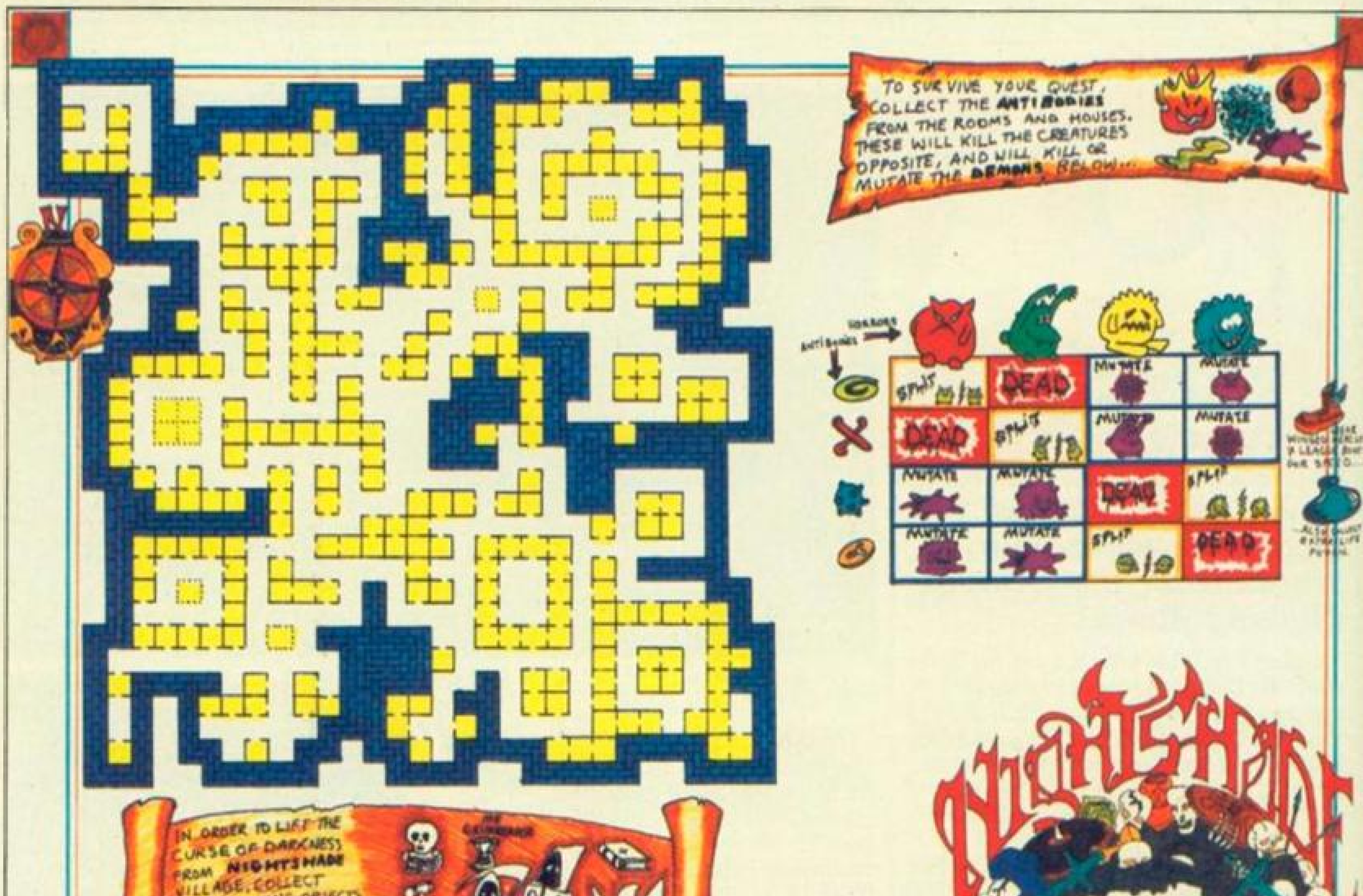
```
0,129,156,129,200,97,255,161,50,
97
1240 REM======== CHARACTER DATA
=======
1250 DATA 255,254,192,255,129,25
4,192,255,255,66,36,24,24,36,66,
255
1260 DATA 0,255,255,0,0,255,255,
0,20,20,0,62,0,20,20,54
1270 DATA 24,24,12,12,24,24,12,1
2,0,0,0,0,0,0,0,0
1280 DATA 255,255,129,66,36,36,6
6,129,255,255,0,0,0,0,0,0
1290 DATA 129,66,36,36,66,129,25
5,255,0,0,0,0,0,0,255,255
1300 DATA 255,254,0,0,0,0,0,0,7,
3,7,7,3,7,3,7
1310 DATA 3,6,12,24,48,96,192,12
0,120,192,96,48,24,12,6,3
1320 DATA 231,231,231,231,231,23
1,231,231,255,255,0,0,0,0,255,25
5
1330 DATA 128,192,224,240,240,25
2,254,255,1,3,7,15,31,63,127,255

1340 DATA255,127,63,31,15,7,3,1,
255,254,252,240,240,224,192,128
```

It's the dead of night — no one can hear you scream. No one, that is, except David Williams, our adventure expert. Call him on 041-770 9599 after 9pm for help with your adventure problems — or nightmares . . .

HOT SHOTS

Heard any good pokes lately? Smashed any high-score barriers? Or perhaps you've just put the finishing touches to a game map that will put thousands out of their misery. Publish and be damned — and paid! Send in your secrets, high scores and maps to Hot Shots, *Your Computer*, Room L221, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.



GRAHAM GOOCH'S CRICKET

The following tip will allow owners of Graham Gooch's Test Cricket on the 64 to save teams.

1. Load and run the Select program, and enter the teams as normal.
2. At the end when the program exists to Basic, enter the following . . .

```
POKE43,0:POKE44,192:POKE45,40:POKE46,194:
POKE56,200:CLR:SAVE"TEAMS" (,8 if using disc)
```

3. When the teams have been saved, switch the 64 off and then on again to reset the pointers, and load the teams by entering the following . . .

```
LOAD"TEAMS",1,1 (or ,8,1 if using disc)
```

4. When the teams have loaded, enter New and then load the main game program.

D A Henry Smithson.

WIZARDRY

Rewind tape to beginning and type: Load (return) — First small bit will load. Poke 1011,248:Poke 1012,252 (return). Run (return). 'Nova' section will now load and '64' will reset. Poke 2969,0 (return).
Sys 2816 (return). The four slow sections will now load.

```
POKE 3216,255:POKE 50766,255 (return)
POKE 3264,234:POKE 3265,234 (return)
POKE 27214,234:POKE 50151,234 (return)
POKE 50152,234:POKE 50153,234 (return).
```

The above pokes will give you more energy and will stop most nasties from deplenishing your energy.
Sys 2970 (return). Start Game.

Jason Hattrell.

Competition

THE GOONIES™



WIN

A fabulous £400 Philips CD-150 compact disc music system as first prize, plus Cyndi Lauper's Goonies Soundtrack

WIN

25 treasure chests, each crammed with doubloons, two goonies film tickets, poster, and a copy of Datasoft's Goonies game for the CBM-64, Spectrum, Atari or Amstrad.

All you have to do is come up with a film or a book you think would make a good computer game. Send us your reasons in writing or draw a sample screen to back your claim.

COMPETITION RULES

- The winners of the competition will be the people who, in the view of the editor, come up with the most interesting or amusing suggestions for books or films to be translated into computer games.
- The names of the winners will be printed in the January issue of *Your Computer*.
- All entries must arrive at the *Your Computer* offices by the last working day in October 1985.
- Each person may enter the competition only once.
- Entries to the competition cannot be acknowledged.
- No employees of Business Press International or their relatives may enter the competition.
- The decision of the editor is final.
- No correspondence on the result of the competition will be entered into.
- Business Press International assumes no responsibility or liability for any complaints arising from this competition.





YOUR COMPUTER COMPETITION

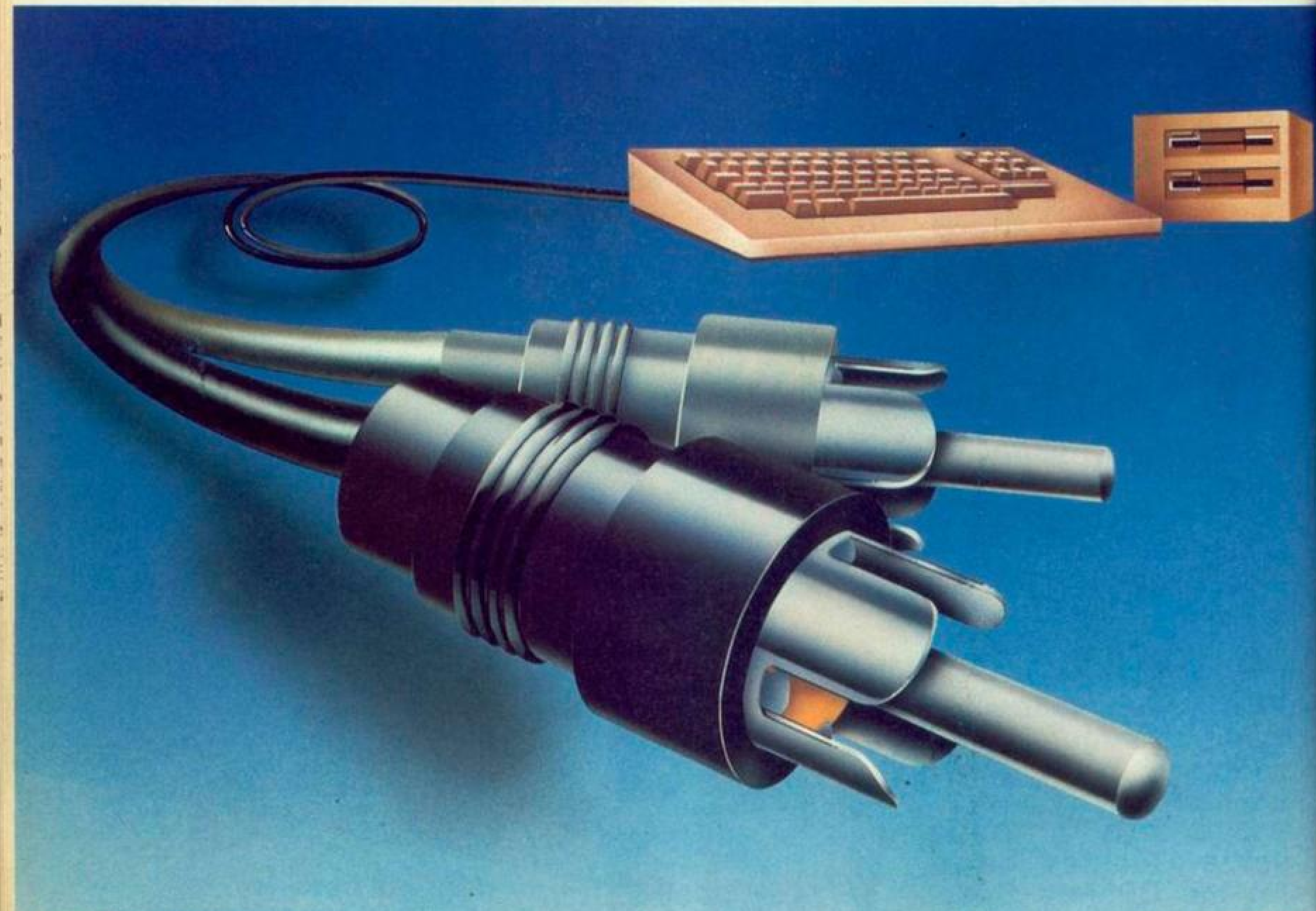
Don't forget to enclose this coupon, or a photocopy of it, when you send in your entry to Goonies Competition, *Your Computer*, Room L221, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Name ______________________

____

Address ______________________

____







TRAP'EM

THE AIM of the game is, by pushing blocks around, to trap the three aliens who are trying to get you. Once an alien is trapped it dies, and can be ignored or squashed, and when all three are dead, you move to the next level — faster aliens and less blocks.

Your man is controlled with a joystick or the cursor keys and by pressing the fire button or space bar, you can move around faster. The arrow on the score level indicates the high-score.

First type in listing 1 — save it before running as the machine will probably reset. Next type in listing 2, run it, correct the errors and save it directly after listing 1 using:

SAVE"CODE",B,36980,924

Rewind the tape and load the game normally.

Renny Garderet springs an Amstrad ambush to alienate the aliens.

Listing 1.

```
10 '####################
20 '#  T R A P  ' E M  #
30 '####################
40 GOSUB 460:'(INITIALISE)
50 GOSUB 290:'(NEW GAME)
60 GOSUB 110:'(NEW SCREEN)
70 CALL MAIN
80 IF PEEK(X(2))=Ø AND PEEK(X(3))=Ø AND PEEK(X(4))=Ø T
HEN FOR N=239 TO 63 STEP -2:SOUND 1,N,1:NEXT:FOR PAUSE
=1 TO 100:NEXT:LVL=LVL+1:GOTO 60
90 CALL SPRITE,PEEK(X(1)),PEEK(Y(1)),3:LVS=LVS-1:FOR N
=63 TO 239 STEP 2:SOUND 1,N,1:NEXT:FOR PAUSE=1 TO 500:
NEXT
100 IF LVS<>Ø THEN 60 ELSE 50
110 '##############
120 '# NEW SCREEN #
130 '##############
140 IF LVL>20 THEN LVL=20
150 CLS#1:FOR N=1 TO 5:CALL SPRITE,19,1+(6-N)*2,2*ABS(
N<=LVS):NEXT
160 FOR N=1 TO 75-LVL*2
170 X=INT(RND*16+2):Y=INT(RND*11)*2+3:IF X=17 AND Y=11
 THEN 170
180 CALL SPRITE,X,Y,1:NEXT
190 RESTORE 200:FOR N=1 TO 4:READ A,B:POKE X(N),A:POKE
 Y(N),B:NEXT:POKE &9244,1:POKE &9171,3
200 DATA 17,11,2,3,2,23,17,23
210 POKE SP,41-LVL*2
220 FOR N=2 TO 4:CALL SPRITE,PEEK(X(N)),PEEK(Y(N)),4:N
EXT
230 X1=XPOS:Y1=YPOS
240 SOUND 1,478,75:FOR Y=202 TO 244 STEP Ø.5:MOVE 558,
Y:DRAWR 4,Ø,Ø:NEXT
250 FOR X=19 TO 18 STEP -1::FOR PAUSE=1 TO 500:NEXT:SO
UND 1,127
260 CALL SPRITE,X,11,Ø:CALL SPRITE,X-1,11,2:NEXT
270 FOR Y=244 TO 202 STEP -Ø.5:MOVE 558,Y:DRAWR 4,Ø,7:
NEXT:PLOT -10,-10,1:MOVE X1,Y1
280 RETURN
290 '############
300 '# NEW GAME #
310 '############
320 WHILE INKEY$<>"":WEND
330 CLS#1:PEN#1,4:PRINT#1:PRINT#1,"   HIGH SCORES":PEN
#1,3:PRINT#1,"   ===========":PEN#1,12:PRINT#1:PRINT#1
,"    SCORE:";:PEN#1,2:PRINT#1,"  Ø"
340 PEN 2:FOR Y=YPOS TO 2 STEP -2:MOVE 580,Y:DRAWR 20,
Ø,Ø:SC=SC+10:LOCATE#1,11,5:PRINT#1,SC;CHR$(7);:NEXT
350 IF SC<HI(10) THEN 390 ELSE HI(10)=SC
360 PEN#1,6:LOCATE#1,4,7:PRINT#1,CHR$(20):INPUT#1,":",
HI$(10):IF LEN(HI$(10))>8 THEN 360 ELSE LOCATE#1,4,7:P
RINT#1,CHR$(20)
370 FOR N1=1 TO 9:FOR N2=N1+1 TO 10:IF HI(N2)>=HI(N1)
THEN H=HI(N2):H$=HI$(N2):HI(N2)=HI(N1):HI(N1)=H:HI$(N2
)=HI$(N1):HI$(N1)=H$
380 NEXT N2,N1
390 FOR N=15 TO 25:LOCATE 20,N:PRINT" ";:NEXT:PLOT -10
,-10,7:TAG:MOVE 608,(HI(1)/10)*2+8:PRINT CHR$(242);:TA
GOFF
400 PEN#1,6:FOR N=1 TO 10:LOCATE#1,1,N+6:PRINT#1,N;HI$
(N);TAB(12);HI(N);:NEXT
410 PEN#1,3:LOCATE#1,3,20:PRINT#1,"SPACE";:PEN#1,4:PRI
NT#1," or ";:PEN#1,3:PRINT#1,"FIRE":PEN#1,4:PRINT#1:PR
INT#1,"    TO START"
420 WHILE INKEY$<>"":WEND:A$="":WHILE A$<>" " AND A$<>
"X":A$=INKEY$:WEND
430 IF A$=" " THEN POKE LEFT,8:POKE RIGHT,1:POKE UP,Ø:
POKE DOWN,2:POKE FAST,47  ELSE POKE LEFT,74:POKE RIGHT
,75:POKE UP,72:POKE DOWN,73:POKE FAST,47
440 LVS=5:LVL=Ø:SC=Ø:PLOT -10,-10,1:MOVE 600,Ø
450 RETURN
460 '##############
470 '# INITIALISE #
480 '##############
490 SYMBOL AFTER 32:MEMORY 36979:LOAD"!CODE",36980
500 SYMBOL 33,10,32,73,2,Ø,36,124,63:SYMBOL 34,Ø,24,60
,60,60,60,24,60:SYMBOL 36,Ø,90,60,60,255,60,126,255:SY
MBOL 38,112,222,236,242,190,222,248,246
510 SYMBOL 254,219,146,146,210,82,82,219:SYMBOL 255,18
7,170,170,171,178,170,171
520 INK Ø,Ø:BORDER Ø:PAPER Ø:MODE Ø:INK 14,Ø,26:INK 15
,26,Ø
530 PEN 5:PRINT "-- - - - -- - - ----":PRINT CHR$(22);
CHR$(1):PEN 3:LOCATE 1,1:PRINT"  T R A P  ' E M":PRINT
 CHR$(22)CHR$(Ø);
540 PEN 7:PRINT CHR$(150);STRING$(16,CHR$(154));CHR$(1
58);CHR$(154);CHR$(156);
550 FOR N=3 TO 12:PRINT CHR$(149):LOCATE 18,N:PRINT CH
R$(149);" ";CHR$(149);:NEXT
560 PRINT CHR$(149):LOCATE 18,13:PRINT CHR$(151);CHR$(
154);CHR$(153);
570 FOR N=14 TO 24:PRINT CHR$(149):LOCATE 18,N:PRINT C
HR$(149):NEXT
580 PRINT CHR$(147);STRING$(16,CHR$(154));CHR$(153)
590 PEN 2:LOCATE 19,14:PRINT CHR$(254);CHR$(255)
600 MOVE 576,Ø:DRAWR Ø,170,3:DRAWR 28,Ø:DRAWR Ø,-170:D
RAWR -28,Ø:PLOT -10,-10,1
610 RESTORE 620:FOR N=1 TO 4:READ Y(N):X(N)=Y(N)+2:NEX
T:SP=&907D:MAIN=&9187:SPRITE=&9249:LEFT=&918C:RIGHT=&9
19C:UP=&91AC:DOWN=&91BC:FAST=&922F
620 DATA &923F,&9240,&9243,&9246
630 FOR N=1 TO 10:HI$(N)="Arnold":HI(N)=330-N*30:NEXT
640 WINDOW#1,2,17,3,24
650 RETURN
```

Listing 2.

```
10 '** HEX LOADER **
20 ADDR=36980:LIN=70:MEMORY ADDR-1
30 SUM=Ø:READ A$,CHECKSUM:IF A$="END" THEN 60
40 FOR N=1 TO LEN(A$)-1 STEP 2:X=VAL("&"+MID$(A$,N,2))
:POKE ADDR,X:SUM=SUM+X:ADDR=ADDR+1:NEXT
50 IF SUM<>CHECKSUM THEN PRINT"ERROR in";LIN:END ELSE
LIN=LIN+10:GOTO 30
60 PRINT"DATA CORRECT":END
70 DATA 3A44923D324492C03E0Ø324492DD46Ø4DD4EØ23A4792D6
Ø33ØØ23EØ632479221 3E921600 5F19229F9ØDD21ØØØØDD7EØ2FEØØ
2ØØ3FEFFC9DD56Ø4DD5EØ2CDØE913ØØ1C9788A28Ø638Ø314180115
,6637
80 DATA 79B828ØØ38Ø41C1C1ØØ21D1D626BCDØ3913Ø1162DD6EØ2
CDØ3913ØØØDD66Ø46BCDØ391DØE5C53EØØCD4C92C1E1DD74Ø4DD75
Ø278BC2ØØ3798DC83EØ4CD4C92FEFFC9E5CD758BE1CD6ØØØFE23C9
,9Ø41
90 DATA 626B25CDØ391D82D2DCDØ391D824CDØ391D824CDØ391D8
2C2CCDØ391D82C2CCDØ391D825CDØ391D825CDØ391D82D2DCDØ391
D83EØ5CD4C92DD36Ø2ØØDD36Ø4ØØ217591CDAABC217E91CDAABC11
,8657
100 DATA ECFF21Ø2ØØCDC3BB111400210000CDF9BB21719135 3EØ
ØFEØØC9Ø1ØØØØCDØ3ØØØF19ØØØ1ØØØØEEØEØØØF32ØØDD213D923EØ
ØCD1EBB2ØØ92125ØØCDDA91C818333EØØCD1EBB2ØØ92124ØØCDDA9
1,6312
110 DATA C818233EØØCD1EBB2ØØ9212D2DCDDA91C818133EØØCD1
EBB2ØØ9212C2CCDDA91C818Ø3CD6ØØØCD749ØC83E42CD1EBB2ØAEC
922EØ91229Ø92DD66Ø4DD6EØ2162524ØØE5CD758BE1CD6ØØØFE262
Ø,8423
120 DATA Ø41623 18EEBADØD5E53EØØCD4C92DD66Ø4DD6EØ224ØØD
D74Ø4DD75Ø2CD758BCD6ØØØFE242ØØ3E1E1C93EØ2CD4C92C1F1FE2
32ØØ53EØ1CD52923EØØCD1EBBCØ21ØØ152B7CB52ØFBFEFFC9ØØØØØ
Ø,8816
130 DATA ØØØØØØØØØØØØØØØØØØDD7EØØDD4EØ2DD46Ø43CØDØ5213892 1
144ØØ193D2ØFCE54Ø69CD1ABC545DE13E1ØF5D5Ø2Ø4ØØEDØØD1EBC
D26DCEBF13D2ØEFC9ØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØ
Ø,58ØØ
140 DATA ØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØ
ØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØØ1
43CØØØØ2CØ4ØF28ØØØAØFØØØØFØØ2ØØØ1E3C28ØØ143C28ØC1E28Ø
Ø,642
150 DATA 2Ø1E1428Ø428 3C3CØ43CØØ3CØ43C3C28Ø5283C3CØ53C3
C1414 28ØØ3C143C3C3CØØØØ3C28ØØ3C28ØØØØØØØØØØØØØØ1428ØØØØ3
C3CØØØØØØØØØØØØ694ØØØØ3C3CØØØØ1428ØØØØC1C2ØØØ4ØC3C38Ø4
Ø,3493
160 DATA C3C38ØØØC1C2ØØØØC9C6449838 3Ø64883Ø3Ø44ØØ44888
ØØØCCCCØØØØØØØØØØØØØØØ3Ø3ØØØØØ2Ø1ØØØ3Ø2Ø1Ø3Ø2ØØØØØØ1Ø3Ø2Ø1
Ø3ØØØØ2Ø1ØØØØØØ2Ø1ØØØØØØ2Ø1ØØØØØØ2Ø1ØØØØØØ2Ø1ØØØØØØ2Ø1ØØØØØØ
Ø,3544
170 DATA ØCØØØ4ØCØØØØØ4Ø4Ø4Ø4ØØCØØØØØCØØØCØCØCØØØØØØØØØ
ØØØØØØØ1Ø458A2ØØØØ459AØØØØCFCFØØCFCFCFCFØØ3333ØØØ443333 8
89D9966EE4433338811 76B922118874221176B92211333322ØØ333
3,4578
180 DATA ØØ28 2Ø1Ø143C28143CØØØØØØØØØØØØØØ2Ø2ØØØ2ØØØØØ1ØØ
Ø2Ø1ØØØØØØØ2ØØØØØØØØØØØØØØ2Ø45ØØ459ACFØØØØCFCF3Ø443CF8A9
D99334544333388117666 6E1188988397674223933893 63C33363
C,4567
190 DATA END,Ø
```

Basic Program.

```
   1 REM MAIN ASTEROIDS BASIC
   2 DIM h(8): DIM h$(8,15): LET
 usr=28501: LET redef=30853
  10 CLS : PRINT 'TAB 11;"ASTERO
IDS"''TAB 5; BY I.M. COLLIER 8/8
5"
  20 PRINT '''TAB 5;"Press P to
                         or K to
play game
redefine keys."
  30 POKE 23658,8: PAUSE 150: LE
T l$=INKEY$
  40 IF l$="K" THEN GO SUB 200:
GO TO 10
  50 IF l$="P" THEN GO TO 300
  60 IF NOT h(1) THEN GO TO 30
  70 CLS : PRINT ''TAB 10;"HIGH
SCORES"'''
  80 FOR x=1 TO 8: IF h(x) THEN
PRINT TAB 5;"00000"(LEN STR$ h(x
) TO );h(x);" ";h$(x)
  90 NEXT x: PAUSE 250: LET l$=I
NKEY$
 100 IF l$="K" OR l$="P" THEN GO
 TO 40
 110 GO TO 10
 200 CLS : PRINT '''"Press the ke
ys for:"'': RANDOMIZE USR redef:
 PAUSE 1: PAUSE 50: RETURN
 300 CLS : PAUSE 50: RANDOMIZE U
SR usr: PAUSE 1: PAUSE 50
 310 IF PEEK (usr-5) THEN GO TO
10
 320 LET sc=PEEK (usr-4)+256*PEE
K (usr-3): IF sc*10>h(1) THEN PO
KE usr-2,PEEK (usr-4): POKE usr-
1,PEEK (usr-3)
 330 IF sc*10<h(8) THEN GO TO 10
 340 FOR x=1 TO 8: IF sc*10<h(x)
 THEN NEXT x
 350 FOR y=7 TO x STEP -1: LET h
$(y+1)=h$(y): LET h(y+1)=h(y): N
EXT y
 360 CLS : PRINT ''TAB 7;"CONGRA
TULATIONS!"''TAB 7;"YOU HAVE TOD
AY'S "''TAB 7;STR$ X AND X>1;"ND
 " AND X=2;"RD " AND X=3;"TH " A
ND X>3;"HIGHEST SCORE."
 370 PRINT 'TAB 4;"PLEASE ENTER
YOUR NAME."
 380 PRINT AT 10,7;"<___________
_____>"
 390 LET N$=""
 400 PRINT AT 10,8;n$;"_" AND LE
N n$<15
 410 PAUSE 0: LET l$=INKEY$
 420 IF l$=CHR$ 12 AND n$<>"" TH
EN LET n$=n$( TO LEN n$-1): BEEP
 .005,34
 430 IF l$=CHR$ 13 THEN GO TO 46
0
 431 LET l$=(l$ AND CODE l$<128)
+("~" AND l$=" STOP ")+("!" AND
l$="NOT ")+("\" AND l$=" STEP ")
+("(" AND l$=" TO ")+(")" AND l$
*" THEN ")+("[" AND l$=" AND ")+
("]" AND l$=" OR ")
 440 IF l$>CHR$ 31 AND l$<CHR$ 1
27 AND LEN n$<15 THEN LET n$=n$+
l$: BEEP .005,34
 450 GO TO 400
 460 LET h(x)=sc*10: LET h$(x)=n
$
 470 GO TO 70
 500 BORDER 1: PAPER 0: INK 7: B
RIGHT 1: CLEAR 26920: LOAD "ASCO
DE"CODE : POKE 23675,42: POKE 23
676,108: POKE 23606,42: POKE 236
07,104: RUN
```

ASTEROID ATTACK is a program for the 16 or 48K Spectrum which is probably as close as the Spectrum allows to the arcade version. It has full rotation not limited by the scope of graphics characters; the ship is drawn onto the screen using sines and cosines. Thrusting provides the ship with frictionless motion up to a maximum speed of just less than that of a bullet.

The ship and bullets are moved to an accuracy of 1/128 of a pixel (stored — not on the screen). Obviously the sound cannot reach the high arcade standard, but I have created the best possible effects.

The machine code is created by the two high-speed data loaders. Type in the first Data Program and save a copy. Run the program and if lines 100 and 110 are correct, the machine code high-speed loader will be saved. If they are not correct, check and double check these lines until they are. If this machine code is correct, the Save and Verify statements can be removed from line 70.

After line 110 has been slow-poked, the other lines will be fast-poked into place (see the difference?). If this does not take place, reload the program and check lines 100 and 110. Don't worry about the mess on the screen as the high-speed loader runs; this is the only place to store the code as yet. When all the errors have been corrected, the code will be saved. Save another copy of the program as well. New the machine and type in program 2. You needn't bother about the lines starting with Rem.

Run the program. If the fast-load code is not in place, it will be loaded before part 2 of the machine code is fast-poked into place. Again, correct all the errors and save the code. Also save the program. New the computer and type:

CLEAR 26900:LOAD "ASCODE1"CODE 26922:LOAD "ASCODE2"CODE 29242

Play the tape on which you saved the two parts of code. The machine code is now set up. The graphics pointer can be set up by

POKE 23675,42:POKE 23676,108

and the new character pointer by

POKE 23606,42:POKE 23607,104

If you like you can test the code by

RANDOMIZE USR 28501

Type in the main Basic program. The finished program can now be saved by

CLEAR:SAVE "ASTEROIDS" LINE 500:
SAVE "ASCODE"CODE 26922,4671

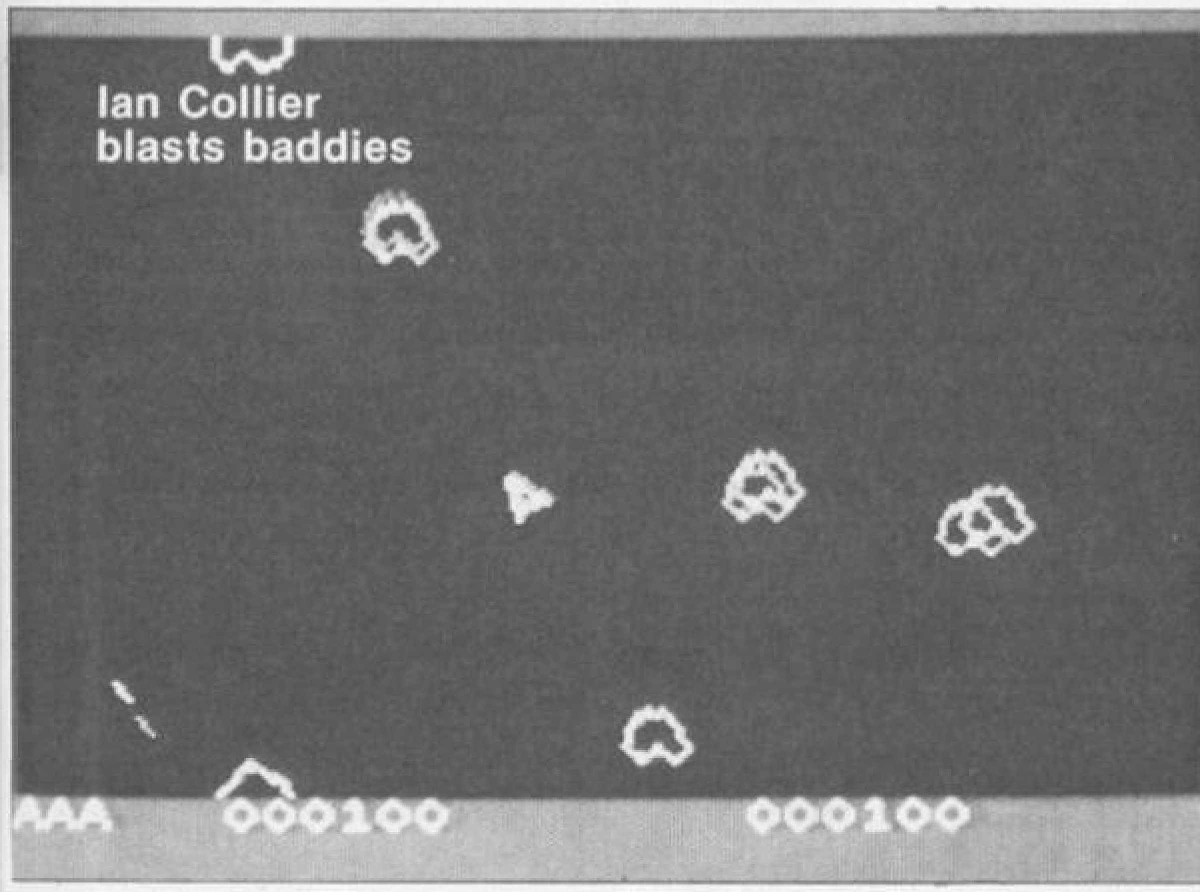
You will notice if you do the Pokes above that I have designed a new character set. The capitals and digits — also all brackets, string and hash — have been made slightly larger and closer to ordinary script. An advantage of this is that capital A looks like a ship and so is used to print the 'lives'. You can shorten the typing by removing this — omit the charcter pointer

Program 1.

```
   1 REM DATA PROGRAM 1
   2 DEF FN a(a$)=CODE a$-48-7*(
a$>"9")-32*(a$>"Z"): DEF FN h(a$
)=FN a(a$(1))*16+FN a(a$(2))
  10 RESTORE : LET a=23296: FOR
x=100 TO 400 STEP 10
  20 READ a$: LET t=VAL a$( TO 5
): LET a$=a$(6 TO ): IF LEN a$/2
<>INT (LEN a$/2) THEN PRINT AT 1
6,0;"Length error in line ";x: S
TOP
  30 IF x>110 THEN PRINT AT 16,0
;"Line ";x;" ";CHR$ USR 23296,a,
a$,t: LET a=a+LEN a$/2: GO TO 80
  40 POKE a,FN h(a$): LET t=t-PE
EK a: LET a=a+1
  50 LET a$=a$(3 TO ): IF a$<>""
 THEN GO TO 40
  60 IF t THEN PRINT AT 16,0;"Er
ror in line ";x: STOP
  70 PRINT AT 16,0;"Line ";x;" O
K": IF x=110 THEN SAVE "hex"CODE
 23296,144: VERIFY "hex"CODE : L
ET a=16384
  80 NEXT x: PRINT AT 16,0;"All
OK - Saving part 1"
  90 SAVE "ASCODE1"CODE 16384,23
20: VERIFY "ASCODE1"CODE
 100 DATA "08740cd811ccda22ded43
905be7cd8c1ccdf12bed53925bcb38cb
19386578b7c21a374121000022945bc5
2a925b7ecbafd610fe0a3802d627fe10
3046070707074f237e2322925bcbafd6
10fe0a3802d627fe"
 110 DATA "0607610302d812a905b77
2322905b5f16002a945b1922945bc110
becd811ccda22d2a945bb7ed427cb520
073e4fd7014b00c911895bafcd0a0ccf
08804552524f528d"
 120 DATA "01422000000000000000000
0018181818180018002424000000000000
0014161c361c3414000081e281c0a3c08
00626408102646000001028102a443a00
0008100000000000000008102020201008
00100804040408 10"
 130 DATA "0161800000014083e081400
0000008083e080800000000000000080810
000000003e00000000000000000000181800
00000020408102000000182442424222418
0018280808080083e003c42023c40407e
003c42021c02423c"
 140 DATA "0252300040c14247f0404
007e40407c02423c003c40407c42423c
007e020408102020003c42423c42423c
003c42423e02023c000000100000001000
000010000001010200000408102010 0804
0000003e003e0000"
 150 DATA "0429000201000804081020
003c42040800000800003c4a565e403c00
00081414223e4141007c42427c42427c
003c42404040423c0078444242424478
007e40407c40407e007e40407c404040
003c42404e42423c"
 160 DATA "0411900424242 7e424242
003e0808080808083e0002020202024 23c
00444850704844420040404040404 07e
0041635549414141004161514945434 1
001c22414141221c007c42427c404040
001c224141452 21d"
 170 DATA "03457007c42427c484442
003c42403c02423c00fe101010101010
0041414141412 21c0041412222141408
0041414149556341004122140814224 1
00412214080808080 07f020408102 07f
003c202020202 03c"
 180 DATA "0237900000402010080400
003c040404043c00103854101010 00
0000000000000000ff001c2278202 07e00
0000380 43c443c000020203c22223c00
00001c2020201c0000004043c44443c00
0000384478403c00"
 190 DATA "02580000c10181010 1000
00003c44443c04380004040784444400
0010000301010380000004000404042418
0020283030282400000101010100c00
000068545454540000000784444444400
00003844444443800"
 200 DATA "02798000007844447840 40
00003c44443c040600001c202020 2000
0000384038047800000103810101 00c00
00004444444443800000004444282810 00
000044545454280000000442810284400
00004444281020 40"
 210 DATA "0244600007c0810207c00
000c101020101 00c000080808080800
003000808040808300 0324c0000000000
3c4299a1a199423c000000000003600c90
1010100820042000420004200024001 20c1
11220e1400080000"
 220 DATA "069170000000000 3600ff0
1ff01ff83ffc3ffc3ffc3ffe7fff3fff
3f3e0e1c0008000000380044000820081c
1002200240002800180018001800 18201
8502488c30700000003 8007c00fe00ffc
1ffe3ffe7ffeffff"
 230 DATA "08434fffffffffffffffff
```

ASTEROID ATTACK

Ian Collier
blasts baddies



Pokes above from the program, also omit lines 120 to 200 inclusive of Data program 1 and change:

LET a = 16384

in line 70 to:

LET a = 17104:LET x = 20

You can also shorten typing by omiting the fast-poke code, though the program will take ages to poke the data. To do this, omit lines 100, 110 in Data program 1, also omit 30, all but the first statement of line 70, and change 10 to:

RESTORE: LET a = 16384 (17104 to omit the character set): FOR x = 120 (210 to omit the character set) TO 400 STEP 10

Also omit 3 and 30 of Data program 2 and add all the lines which in the listing start with Rem, but do not type Rem — (except line 1). However the fast-poke code greatly reduces poking time and can be used in other programs where hex has to be poked into memory and a checksum is provided. The syntax is:

PRINT USR 23296, destination, hex

— either a string name eg. a$ or a string of digits eg. "01ed2f"), checksum — (the sum of all the bytes in the string).

Having saved a copy of the finished program onto tape (with or without character set and/or fast-poke), you are now ready to clear the computer and load it.

You are given the option to play the game or redefine the keys — no joystick option, I'm afraid; Interrupt mode 2 on a 16K machine crashes with certain peripherals attached. If you do not redefine the keys they are X-left, C-right, L-fire, P-thrust, Z-Hyperspace, and Space-Abort. You will appear in the centre of the screen. The object is to avoid being killed by the rocks hurtling towards you by blasting them out of space. These large rocks, on being hit, will split up into two smaller asteroids, which in turn split up into two small ones.

These are destroyed when you hit them. If

(continued on next page)

```
fdfe78fc307000001c62818182814638
1c7effffeff7e380000000003c00420
05a005a004203ffc4002924992494002
3ffc0000000000000000000003c007e0
07e007e007e03ffc"
 240 DATA "054887ffeffffffff7ffe
3ffc0000000000000000000001c00220
02a002200ff81004255210040ff80000
00000000000000000000000001c003e0
03e003e00ff81ffc3ffe1ffc0ff80000
0000000000000000"
 250 DATA "09039110101d9e5d9cb79
2805af914f1effcb782805af904716ff
79b8300669d5af5f1808b1282a6841d5
160060781f853803bc3807944fd9c1c5
18044fd5d9c12a7d5c78844779854fcd
8d6dd97910dfd1d9"
 260 DATA "09624e1d9c978feb0d4ae
6ded437d5ccdaa2247043efe0f10fd47
7ea0fdcb57562002a82f77c9fed83804
c6b047c9d6b047c91e01cb7928041eff
cbb9cb7128043e80914f692600d51126
6e19d14e2600af2e"
 270 DATA "1008508cb1117b8380190
3fcb142d20f36f1dc8af9467af956fc9
c579d6404fcdba6dc1cd0b6ee5c5cdba
6dc1cd0b6e44e14cc97cb5cb7f20077d
a717b8d824c9af95a717b8d825c9cdf2
6dc33a6d00060c12"
 280 DATA "13064181f252b31373d44
4a4f555b61676d72787d83888d92979c
a1a6abafb4b8bcc1c5c9ccd0d4d7dadd
e0e3e6e9ebedf0f2f4f5f7f8fafbfcfd
fdfefefeff3ae46eed4be56ecb45282e
c5c6e04f063ccdf2"
 290 DATA "099226de1e57c80477d81
4fcd8d6d3ae46ec6a04f063ccd206e3a
e46ec6604f063ccd206ec13ae46ec506
3cc6404fcdf26de17884477d814fc5cd
8d6d3ae46e061ac6b04fcd206ee13ae4
6e227d5c061ac6d0"
 300 DATA "080674fcd206e3ae46e06
80c6504fcd206e3ae46e062bc6804fc3
206e008058097600000000cd6b0dcdf6
77cdb2773a4f6f3c324f6f32d87687c6
36672e1022d6763ad8764721697b7023
360123cd6076cb2f"
 310 DATA "07955cb2fcb2f774f23cd
6076cb2fcb2fcb2f5ffeb03802d65077
2379cb2fcb2f774f237bcb2fcb2fcb2f
77b12001342310c622d976c90a05018e
030000ed73d476af3241713e0332506f
3e02324f6f324e6f"
 320 DATA "08800210000221a742251
6f221874cded6e21805822e56e210000
22e96e22eb6eaf32e46e3240713e06ed
47ed5ec38570760184030b78b120fbfd
cb57d63a99706fcd676eaf47cd607878
ce0047cd6a7878de"
 330 DATA "079210047a720073e0332
9870180f3a9870a728093d3298707880
801806788787878780473ae46e8032e4
6e3efedbfecb4f2014212823110500cd
b503cd60766fcd60766722e56e214071
7ea72801353ebfdb"
 340 DATA "10366fecb4fccb5703a99
701f30353ae46e4f0604c5cdba6dc1e5
79c6404fcdba6ded4be96e54e15c2aeb
6ecd9a7078c60ffe1e300e79c60ffe1e
300722eb6eed43e96e2ae56eed4be96e
78844779854fed5b"
 350 DATA "10037e76e2aeb6ecd9a70
22e76e78feb0380afed83eb030023e50
8047ed43e56ecd7e7820083e3eed56ed
47fbc9fdcb5796cd74789f3c3299706f
cd676ec3986f03007c82e2a670043002
0505d680677d83e2"
 360 DATA "08378b3700c30020d0dd6
806fc97ea73e0277c02ae56e22667a3a
e46e32687a21417146f3347887878780
6f2600114471193610232242713a687a
4f0619c5cdba6dc1e579c6404fcdba6d
c1dd2a4271dd7004"
 370 DATA "07932dd7405dd7106dd75
07ed5b667a3a41711f380a78cb2f835f
7ccb2f8257dd7300dd7201dd360200dd
3603002132000604c5e5110a00cdb503
f3e1c1110a001910ef214071fbc90001
4571004c44e9ebf6"
 380 DATA "12198fffdfa63c9fe53c0
fdcb015663c9fe53c0fdcb015663c9fe
53c0fdcb015663c9fe53c0fdcb015663
c9fe53c0fdcb015663c9fe53c0fdcb01
5663c9fe53c0fdcb0156c0c33463f1f5
210000c0c33463f1"
 390 DATA "10054f5210000e5e5e530
18060011e37f1afdcb0146200cfdcb01
f6cdad753e07da777afe3bcab872cdc9
772a687ecd4d74211f7be51600d521e9
7f1808cdd8743e02dab871dde5e5d5c5
f52a7d5ce53a915c"
 400 DATA "09134f508f5d9c5d5d9ff
f321d676352009237e2b77218813180b
7e872396fe02300a218e12110200cdb5
03f3cd54793a4171a7ca057347dd2144
71c5fdcb57d6dd4e01dd4602c5cd8d6d
dd4e05dd4606cb29"
```

(continued from previous page)

one hits you — and all crashes are screen-checked, so no gyps — you explode and, providing you have a life left, you will appear back on the screen when a box 100 by 80 pixels is clear of asteroids. If you think this box is too large or too small, you can alter its size (see Pokes Table). In a desperate situation, hyperspace takes you away from the path of converging asteroids and plants you in a random position on the screen. However, this may move you into the path of another asteroid — so use with caution.

Levels vary in difficulty, partly because more asteroids appear. There are also alien ships which career across the screen firing at you. It can split asteroids — you get the points — but this can be a hazard as more small asteroids are created. If it crashes into an asteroid, it has a chance of being blown up — you don't get the points. There are two sizes of alien: slow large ones — these usually blow up on contact with anything — and faster small ones — these may not blow up on contact with an asteroid. The

The following pokes are available — normal contents are in brackets.

28510 Number of lives. (do not use more than 32. However if you use more than 6, the score will be printed on top of them.) (3)

28515 One less than the starting number of asteroids. If you poke this with an odd number, you will not be able to be killed. (2)

31099 Controls the generation of aliens. A higher number gives increased probability (11).

31116 Controls the type of aliens. A higher number means a greater proportion of large aliens. (15)

The following locations hold the parameters for the box which must be clear of asteroids before your ship is printed:

30773 Left x coordinate (78)
30777 Right x coordinate (178)
30784 Bottom y coordinate (48)
30788 Top y coordinate (128)

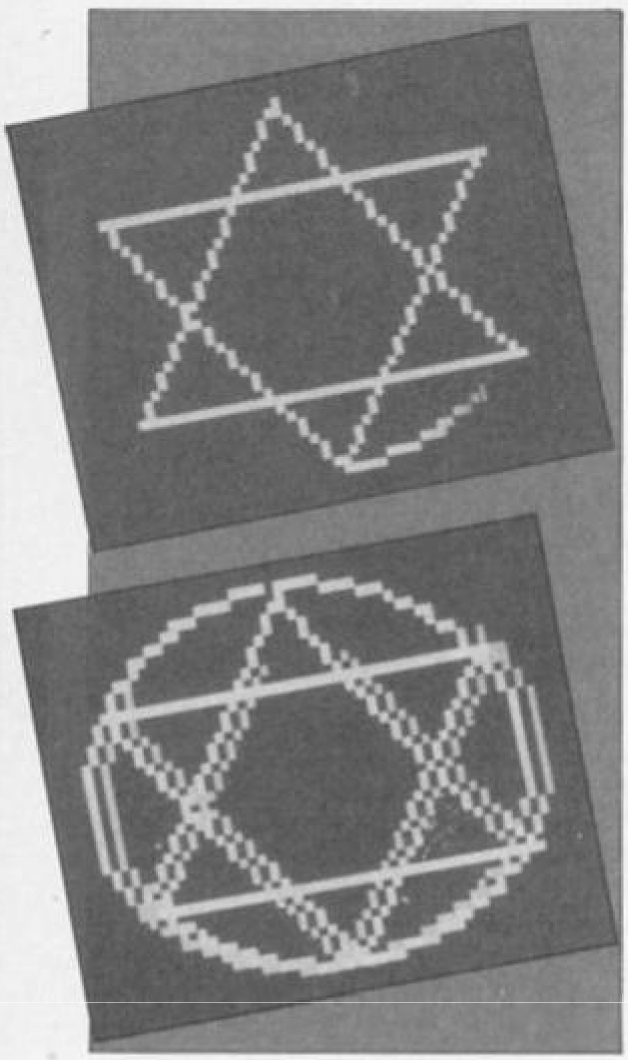
If you abort a game with a high score, your achievement will not be recognised. To change this, remove line 310 from the Basic program. If the program seems too daunting, I will supply a cassette of the completed game for £2.00 to: Ian Collier, 57 Wyndham Avenue, Bolton, BL3 4LG. ■

Program 2.

```
   1 REM DATA PROGRAM 2
   2 DEF FN a(a$)=CODE a$-48-7*(
a$>"9")-32*(a$>"Z"): DEF FN h(a$
)=FN a(a$(1))*16+FN a(a$(2))
   3 IF PEEK 23296<>2Ø5 THEN PRI
NT "Loading hex code": LOAD "hex
"CODE : CLS
  1Ø RESTORE : LET a=16384: FOR
x=1ØØ TO 39Ø STEP 1Ø
  2Ø READ a$: LET t=VAL a$( TO 5
): LET a$=a$(6 TO ): IF LEN a$/2
<>INT (LEN a$/2) THEN PRINT AT 1
6,Ø;"Length error in line ";x: S
TOP
  3Ø PRINT AT 16,Ø;"Line ";x;" "
;CHR$ USR 23296,a,a$,t: LET a=a+
LEN a$/2
  4Ø REM POKE a,FN h(a$): LET t=
t-PEEK a: LET a=a+1
  5Ø REM LET a$=a$(3 TO ): IF a$
<>"" THEN GO TO 4Ø
  6Ø REM IF t THEN PRINT AT 16,Ø
;"Error in line ";x: STOP
  7Ø REM PRINT AT 16,Ø;"Line ";x
;" OK"
  8Ø NEXT x: PRINT AT 16,Ø;"All
OK - Saving part 2"
  9Ø SAVE "ASCODE2"CODE 16384,23
51: VERIFY "ASCODE2"CODE
 1ØØ DATA "Ø8Ø52cb28cd3a6dc1dd7e
ØØa72Ø3b3a41713d3241713c47878787
8Ø4fØ6ØØdde5d121Ø9ØØ19edbØdde5d1
2a1a74a7ed52daØØ7328Øb1911f7ff19
221a74c3ØØ7321ØØØØ221a74c3ØØ73dd
35ØØdd66Ø6dd6eØ5"
 11Ø DATA "Ø8119788447febØ38Øafe
d83ebØ3ØØ23e5Ø8Ø4779854fdd66Ø8dd
6eØ7dd5eØ3dd56Ø4cd9a7Ø7ccb7c2ØØa
fe1938Øed619Ø4671808fee73ØØ4c619
Ø5677dcb7d2ØØafe1938Øed619Øc6f18
Ø8fee73ØØ4c619Ød"
 12Ø DATA "1Ø1726fdd71Ø1dd7ØØ2dd
75Ø3dd74Ø4fdcb5796cd8d6ddd4eØ5dd
46Ø6cb29cb28cd3a6d11Ø9ØØdd19c1Ø5
c22372cd1c74d9d1c1d9f1Ø8f132915c
e1227d5cf1c1d1e1dde1fbc9321674d9
e5ØfØf3d28Ø53cfe"
 13Ø DATA "Ø6598cØ38Ø2d63Ø6f26ØØ
ed5b7b5c19eb212ØØØ3a1674feØ22ØØ3
21Ø8ØØ19eb4d44d921ØØØØ22c973cdaa
22321774e5d9e1d9Ø61Ø3a1674feØ22Ø
Ø2Ø6Ø8c5d9e5ØaØ3Ø83a1674d6Ø228Ø2
ØaØ3d94fØ84716ØØ"
 14Ø DATA "1Ø1Ø56ad91a13Ø83a1674
d6Ø228Ø21a13d967Ø85f3a1774a728Øf
cb38cb19cb1acb3bcb1ccb1d3d2Øf1d9
7ed9a3a8c4c373d9cdcb737ed9a4a9c4
c373d9cdcb737ed9a5aac4c373d9c3d5
733eØ132c973c9ØØ"
 15Ø DATA "Ø8779ØØ2c7de61fcØ7dd6
2Ø6fc9e1247ce6Ø72Ø187dc62Ø6f3812
7cd6Ø867fe5Ø2ØØa7dfecØ38Ø5264Ød6
cØ6fd9c1Ø5c265733aca73a728Øffe1Ø
28Øbfe Ø82ØØb3a1674feØ22ØØ43ac973
a7e1d9c9ØØØ4feca"
 16Ø DATA "1Ø4Ø844713ad876a7cced
6e3ad876473a1874a7cc7779dd21697b
dd35ØØc5dd7eØ1dd4eØ2dd46Ø32Ø3fdd
36ØØØ4fdcb57d6c5cdc275fdcb5796c1
dd7eØ1feØ3d2cf79dd7eØ4814fdd7eØ5
8Ø47febØ38Øafed8"
 17Ø DATA "Ø83333ebØ3ØØ23e5Ø8Ø47
dd71Ø2dd7ØØ3dd7eØ1c5cdc275c13a41
71a7282b2145715f7e913cfe1Ø3Ø1878
23962b3cfe1Ødaf7745778feØf3ØØ87a
d65Øfe1Ødaf7747b11Ø9ØØ193d2Ød83a
4e6f1f38352ae56e"
 18Ø DATA "Ø98367d91c6Ø4fe163Ø22
7894c6Ø4fe1638Ød5f78feØf3Ø147bd6
5Øfe163ØØddd7eØ1fdcb5796cd1e73c2
9Ø76dd7eØ1feØ3d45479c111Ø6ØØdd19
Ø5c23274c92b7e23a7caa974dd7eØ1e5
c5fdcb5796f5d5cd"
 19Ø DATA "1Ø1131e73d12ØØ6f1c1e1
c3a974f1fdcb57d6c1c5cdc275cd8d77
21d776350 6Øfcd7176c1e1dd7eØ12b36
ØØfeØ2382e21d87635dd7eØ1feØ338Ø4
af3218742ad976dde5d1a7ed52444d21
Ø6ØØ19edbØ11faff"
 2ØØ DATA "Ø7846dd192ad9761922d9
76188711Ø5ØØ197ecb2fcb2fdd86Ø45f
3cdd77Ø4237ecb2fcb2fdd86Ø557cd6Ø
76e6Ø182dd77Ø5dd7eØ13d28Ø23eØ2dd
77Ø121d876342ad976360 4237723dd7e
Ø277dd7eØ3237723"
 21Ø DATA "Ø7787cd6Ø76e6Ø12f8377
cd6Ø76e6Ø12f8223772322d976c3e474
321674d9e5ØfØf3d28Ø53cfecØ38Ø2d6
3Ø6f26ØØed5b7b5c19d9cdaa22321774
Ø61Ø3a1674feØ22ØØ2Ø6Ø8c5e5d97e23
Ø83a1674d6Ø228Ø2"
 22Ø DATA "Ø93557e23d94fØ85f16ØØ
3a1774a728Ø947cb3bcb19cb1a1Øf8fd
cb5756 2Ø127bae77cdcb7379ae77cdcb
737aae77c33b767b2fa677cdcb73792f
a677cdcb737a2fa677e1247ce6Ø72Ø18
7dc62Ø6f38127cd6"
 23Ø DATA "Ø9656Ø867fe5Ø2ØØa7dfe
cØ38Ø5264Ød6cØ6fc11Ø9Øe1d9c9e5d5
ed5f6f26ØØ11697a197ed1e1ed4fc9e5
21697a7e23ØeØ85fe618f6Ø1d3fe1614
f5f1152Øfb7bØfØd2Øed1Øe7e1c93eff
32d676324e6f2118"
 24Ø DATA "Ø8874747ea72ØØ236Ø221
1974cbfeed7bd476215827d9215Ø6f35
cdf677fbcdØa773a5Ø6fa728Øecd1178
3eØa32d676324e6fc3796fed563e3eed
47c9116907360cb17be5Ø6Ø5c53ae46e
864f234623e5cdf2"
 25Ø DATA "1Ø5616d2ae56e78844779
854fcd8d6de13ae46e864f23Ø634e5cd
2Ø6ee1c11Ød6e1c9fdcb57962eØØcd67
6eØ65Øcd7176fdcb57d62eØ1cd676eØ6
Ø5214277c5fdcb5796cddb76Ø65Øcd71
76fdcb57d6cddb76"
 26Ø DATA "Ø9837110fØØ19c11Øe5c9
3c32cc4432b4f65Ød48a5ØaceØ3c843a
2fc8462fb8fd4ad68c4aaadc3286382d
c4482dbcf144d88f44a8d829883626cØ
4a26cØee3adc924aa4d7268a342Øbc4c
2Øc4ec3ØeØ945ØaØ"
 27Ø DATA "Ø6575d6238cdd7eØ111Øa
ØØa7281511Ø5ØØ3d28Øf11ØfØØ3d28Ø9
1119ØØ3d28Ø31132ØØ2a516f1922516f
Ø6Ø6fdcb57962a516fcdce77Ø6142a53
6fed5b516fa7ed5219 3ØØ1eb3e16d7af
d778d71e3ØØ1fØd8"
 28Ø DATA "Ø9865cd2a19Ø118fccd2a
19Ø19cffcd2a19Ø1f6ffcd2a197dcdef
157bd7c93e16d7afd7afd7fdcb57963a
5Ø6fa728Ø6473e41d71Øfb3e2Ød7c93a
d876a7c8fb473eff32d6762118747ea7
2ØØ236Ø223cbfecd"
 29Ø DATA "1Ø38Ø7e78c8dd21697bdd
7eØ2fe4e38Øffeb23ØØbdd7eØ3fe3Ø38
Ø4fe8Ø38ca11Ø6ØØdd191Øe33e1Ø32d6
76211974cbbe2b7efeØ4dØ36ØØc93efe
dbfecb5737cØa7c93efedbfecb5f37cØ
a7c93edfdbfecb47"
 3ØØ DATA "Ø866537cØa7c93e7fdbfe
cb47c921df78Ø6Ø6c5e511eb78783dcd
ØaØcaf32Ø85c763aØ85ca728f9d7Ø6fe
78dbfeØeØ51f3Ø12Ød2Øfacb ØØ38f13e
Ø8d73e2Ød73eØ8d718d8e15e235623e5
eb7Ø11Ø4ØØ193eØ5"
 31Ø DATA "Ø754591878787c6477721
64ØØ1164ØØcdb5Ø3e1c11Øacc961786b
78757 8Ø87Øe46f7f788ØØd41626f7274
2Ø2Ø2Ø2Ø2ØbaØd48797Ø6572737Ø6163
65baØd46697265 2Ø2Ø2Ø2Ø2Ø2ØbaØd54
687275737 42Ø2Ø2Ø"
 32Ø DATA "Ø88Ø82ØbaØd5269676874
2Ø2Ø2Ø2Ø2Øba4c6566742Ø2Ø2Ø2Ø2Ø2Ø
bac5cd1e73c1c8dd7eØ1fdcb57d6cdc2
75Ø6Øacd7176fdcb5796e1af321874c3
37752a1a747cb5c83a4e6f1fd8235e23
562ae56e7c92c6Ø3"
 33Ø DATA "Ø915ØfeØ6dØ7b95c6Ø3fe
Ø6dØc39Ø763a4f6fc6Øb57cd6Ø76badØ
4fcd6Ø76badØ81badØfeØf3eØ4deØØ21
d876342ad97636Ø12377233 6Ø123cd6Ø
76e67fc6147723 36Ø323cd6Ø76e6Ø187
3d4787 8Ø772322d9"
 34Ø DATA "Ø8931763ad8764721ØØØØ
221a743eff321874af321974c92a1a74
7cb52Ø2ec5c5cd6Ø7632687ac64Ø4fØ6
1ccdf26de17cd6Ø88Ø677dc6Ø8816f22
667adde5cdc77Øf3dde12a42712b221a
74c13a1974cb7f2Ø"
 35Ø DATA "Ø776Ø2f6717179f873c84
fe4Ø2ØØ1affeØ52ØØ23e4a321974e61f
87878787c6966f26ØØcb14c5dde511Ø4
ØØcdb5Ø3f3dde1c121657a352ØØa361e
3a1874eeØ1321874 3eØ6dd96Ø1dd77ØØ
79c6Ø34f3a18741f"
 36Ø DATA "Ø96623ØØ578dd86Ø54778
c363741ded57bb9394152ab1Ø25a913d
bec1dbØcØad863776553c79b6c9a9dØ9
acef66ad1Ø1c2Ø5e3452e9276bcffd2b
388b6d14c4f173a5dfa93c24dØ5Øf3aØ
4Ø58218f6aaacbe8"
 37Ø DATA "Ø9641ae4beab2bce45942
3a4d9222bbd18e5cØØØ8c5e2eØ579829
caa6dafe253e764378 7ca8a244c3a747
511b18fa1ffØ8319Ø7b7b5Ø17ba1fb3b
b99e23ab32e6e5c68c1385Ø5ec122e36
26315faf28Ødd717"
 38Ø DATA "1Ø634f5e34c72ffed7a86
99f7cacd96Ø4Ø3cØd6ee8879117e64a4
7f3f378482c9872f55d3544e5dd948d5
8db66Øfc95f849bdØe8946f2459Øb4bf
62Ø61681679f8a331a3ØdcØf3561ebbØ
6f7Ø97f95bc81e6e"
 39Ø DATA "Ø4377Øb692dbae7dd8Ø9c
d27d6856f4c239742ca3e1751df6b841
4f4aced4de71b3"
```

Listing 1.

```
100 P=52992:T=18680
110 FORX=PTOP+153:READB:T=T-B:POKEX,B:NEXT
120 IFTTHENPRINT"CHECKSUM ERROR:"-T:STOP
130 R1=INT((P+128)/256):R0=P+128-R1*256
140 POKEP+1,R0:POKEP+2,R1:POKEP+6,R0:POKEP+7,R1
150 R1=INT((P+138)/256):R0=P+138-R1*256
160 POKEP+72,R0:POKEP+73,R1:POKEP+123,R0:POKEP+124,R1
200 DATA 32,128,207,132,  2, 32,128,207
210 DATA192, 50,176,125,169, 79,197,  2
220 DATA144,119,152,162,  0,134,252, 74
230 DATA  8, 10, 10, 10,133,251, 10, 38
240 DATA252, 10, 38,252, 24,101,251,144
250 DATA  2,230,252, 70,  2,  8,164,  2
260 DATA133,251,133,253,165,252, 72, 24
270 DATA189,136,  2,133,252,104, 24,105
280 DATA216,133,254,177,251,162,  0,221
290 DATA138,207,240,  7,232,224, 16,144
300 DATA246,162,  0,169,  1, 40,144,  1
310 DATA 10, 40,144,  2, 10, 10,134,  2
320 DATA174, 52,  3,240, 11,202,240,  4
330 DATA 69,  2,144,  8,  5,  2,144,  4
340 DATA 73,255, 37,  2,170,173,134,  2
350 DATA145,253,189,138,207,145,251, 96
360 DATA 32,253,174, 32,138,173, 32,247
370 DATA183, 96, 32,126,124,226,123, 97
380 DATA255,236,188,127,225,251, 98,252
390 DATA254,160
```



ALTHOUGH THERE are many clever and complicated graphics utilities available for the 64 I have not come across one that allows the use of a simple "plot" facility without the bother of going into bit-map mode. Double density plotting is a method that can be used to do this and Blocks is a short and simple machine code routine that will allow double density plotting.

It utilises the fact that within the Commodore 64's built in character set are a range of block characters — quarter squares and a half squares, so that in conjunction with reverse video it is possible to display all the 16 variations of quarter squares within one character position. To put it another way, these characters can effectively double the resolution of the screen from 40 by 25 to 80 by 50.

Usual restrictions apply

Of course they are only blocks and the usual colour restrictions of the 64's display apply, but they can be very useful and because they do not need bit-map mode to be used, they can mixed freely with text on a normal screen from Basic.

The machine code routine is quite short — just over 150 bytes — and is intended to be located at 52992 (hex CF00) which is the top page of the much used 4K block of Ram from 49152 upwards. However, by changing just eight bytes you could relocate it anywhere in Ram, in the cassette buffer, for example. Listing 1 does this for you.

Listing 1 is a Basic loader program which will install the machine code routine in memory, in addition should you wish to relocate the routine then the Basic program will do this for you — simply change the value of P in the first line. The loader can very easily be made part of another program.

Once the routine is in memory it can be called form Basic by a Sys command in the following format:

SYS P,X,Y

Where P is the start address of the routine — 52992 as listed — X is the x co-ordinate (0-79) and Y is the y co-ordinate (0-49). X and Y may be any valid Basic expressions, any values out of the ranges shown will be ignored.

The only other information required by the routine is the type of plot that you want it do do. This is controlled by the contents of location 820 in the following way: a zero will cause unplotting, a one — plotting and anything else will cause Exclusive-or plotting — to change whatever is there already. Any plotting will be done in the current cursor colour so changing the cursor colour will change plot colour.

Listing 2 is a demonstration program which will plot a few things using the Blocks routine and listing 3 is a version of biorhythms which uses Blocks to plot the charts. The biorhythms program accepts date in the format 1.1.85, any reasonable character may be used to separate the numbers and an asterisk will end the program.

Listing 3.

```
1 POKE53280,0:POKE53281,0:GOSUB2000
10 PRINT""TAB(13)
20 PRINT""SPC(26)"[illegible]"SPC(26)""
30 PRINT"WHAT IS YOUR NAME ";:MX=18:GOSUB1000:N$=L$
35 IFN$=""THENN$="NYBODY"
36 IFN$="*"THENPRINT"":END
40 PRINT"WHAT IS YOUR DATE OF BIRTH ";:MX=10
50 GOSUB1000:D$=L$:IFD$=""THEN110
55 IFL$="*"THEN10
60 D=INT(VAL(L$)):L$=MID$(L$,LEN(STR$(D))+1)
70 M=INT(VAL(L$)):L$=MID$(L$,LEN(STR$(M))+1)
80 Y=INT(VAL(L$)):IFY<100THENY=Y+1900
100 IFM>.ANDM<13THENIFD>.ANDD<=(L(M)-FNL(Y))THEN120
110 PRINTTAB(27)"";:GOTO50
120 SX=ASC(MID$(E$,D))-65
130 PRINT"AME:"N$:PRINT"ORN ON "D""S$(SX)" "M$(M)" IN"Y
140 Z=FNM(M-(D>Z(M))):Z$=Z$(Z):IFD=Z(M)THENZ$=Z$+"/"+Z$(FNM(M+1))+" CUSP"
150 PRINT"ODIAC SIGN: "Z$:GOTO200
200 PRINT"HAT DATE WOULD YOU LIKE TO HAVE YOUR -
210 PRINT"BIORYTHMS CALCULATED FOR ";:MX=10
220 GOSUB1000:DD$=L$:IFL$=""THEN310
225 IFL$="*"THEN10
230 DD=INT(VAL(L$)):L$=MID$(L$,LEN(STR$(DD))+1)
240 MM=INT(VAL(L$)):L$=MID$(L$,LEN(STR$(MM))+1)
250 VV=INT(VAL(L$)):IFVV<100THENVV=VV+1900
300 IFMM>.ANDMM<13THENIFDD>.ANDDD<=(L(MM)-FNL(VV))THEN320
310 PRINTSPC(27)"";:GOTO220
320 IFVV<YTHEN310
330 IFVV=YANDMM<MTHEN310
340 IFVV=YANDMM=MANDDD<DTHEN310
400 PRINT"NE MOMENT PLEASE...
410 N=(VV-Y)*365-D+DD+((M>2)ANDFNL(Y))+((MM<3)ANDFNL(VV))
420 FORX=YTOVV:N=N-FNL(X):NEXT
430 IFM>1THENFORX=1TOM-1:N=N-L(X):NEXT
440 IFMM>1THENFORX=1TOMM-1:N=N+L(X):NEXT
450 IFN<36500THEN500
460 PRINT" "DD$", THAT'S"N"DAYS OLD ???
470 PRINT" HO DO YOU THINK YOU ARE - ETER AN ?
480 PRINTTAB(14)"TRY AGAIN
490 GOTO200
500 SX=ASC(MID$(E$,DD))-65
510 PRINT"AME:"N$:PRINT""DD""S$(SX)" "M$(MM)" IN"VV
520 PRINT"YOU WILL BE"N"DAYS OLD."
530 PRINT"OUR BIORYTHMS WILL BE SHOWN AS FOLLOWS-
540 PRINT" RED  SHOWING YOUR PHYSICAL CYCLE,
550 PRINT" GREEN  FOR YOUR EMOTIONAL CYCLE AND
560 PRINT" BLUE  YOUR INTELLECTUAL CYCLE.
570 PRINT"HE CHARTS SHOW 2 WEEKS BOTH BEFORE AND AFTER THE DATE SHOWN.
580 PRINT" RESS    WHEN YOU ARE READY...
590 GETK$:IFK$<>CHR$(13)THEN590
600 PRINT""N$TAB(19)"+"TAB(22)N"DAYS OLD
610 PRINT"BORN ON "D$TAB(23)"ON "DD$
620 PRINT"":FORX=1TO23:PRINTTAB(19)"|":NEXT
630 PRINT" (1 DAY/DIVISON)"
640 PRINT"";
650 PRINT""
700 PRINT" ";:POKE820,1
710 FORG=0TO2:PRINT" "MID$("",G+1,1)" "MID$("",G+1,1)" ";
720 W=W(G):FORX=0TO77:NN=N+X/2-19.5
730 SYSPLOT,X,25-20*SIN(NN/W*2*π):NEXT:NEXT
740 PRINTTAB(24)"RESS  "
750 PRINTTAB(27)"TO EXIT..."
780 POKE198,.
790 GETK$:IFK$<>CHR$(13)THEN790
850 PRINT" O YOU WANT ANOTHER GO ? ";:MX=3:GOSUB1000
860 IFLEFT$(L$,1)="N"THENPRINT"":END
870 IFLEFT$(L$,1)="Y"ORL$="OK"ORL$=""THEN10
880 GOTO850
1000 PRINT"";:L$=""
1010 GETK$:IFK$=""ORK$=CHR$(34)THEN1010
1020 IFK$=CHR$(13)THENPRINT" ":R
```

DOUBLE DENSITY BLOCKS



Keith Suddick simplifies the extensive but complex graphics facilities of the CBM-64 using block characters with a short and simple machine-code routine.



Listing 2.

```
10 REM DOUBLE DENSITY EXAMPLES
15 REM FOR π READ PI
20 PRINT"♥":POKE53280,0:POKE5328
1,0
30 P=52992:XX=80:YY=50:MX=79:MY=
49:X2=40:Y2=25
40 POKE820,1:REM PLOT
100 C$="■■■■■":FORZ=0TO20STEP4
110 PRINTLEFT$(C$,1);:C$=MID$(C$
,2)
120 FORX=ZTOMX-Z:SYSP,X,Z:SYSP,M
X-X,MY-Z:NEXT
130 FORY=ZTOMY-Z:SYSP,Z,Y:SYSP,M
X-Z,MY-Y:NEXT
140 NEXT
150 FORX=0TO100:POKE199,XAND1
160 PRINT"■■■■■■■■■■■■■■■■"TAB(13)
"DOUBLE DENSITY"
170 NEXT
180 FORD=1TO500:NEXT
200 PRINT"■■";:A=23:D$="■"
210 FORX=1TO24:D$=D$+"■"+CHR$(20
)+CHR$(13):NEXT:D$=D$+"■"+CHR$(2
0)+"■"
220 FORX=0TO159
230 SYSP,X/2,Y2+A*SIN(X*π/X2)
240 SYSP,X/2,Y2-A*SIN(X*π/X2)
250 NEXT:PRINT"■";
260 FORX=0TO79:PRINTD$
270 SYSP,79,Y2+A*SIN(X*π/X2)
280 SYSP,79,Y2-A*SIN(X*π/X2)
290 NEXT
300 PRINT"■";:FORA=20TO10STEP-10
310 FORX=0TO2*πSTEPπ/(A*3)
320 SYSP,X2+A*SIN(X),Y2+A*COS(X)
330 NEXT:PRINT"■";:NEXT
340 FORD=1TO700:NEXT
400 PRINT"■■";:A=1.5
410 FORY=0TO31
420 SYSP,40-Y/A,Y+5:SYSP,40+Y/A,
Y+5
430 SYSP,40-Y/A,45-Y:SYSP,40+Y/A
,45-Y
440 NEXT
450 FORX=19TO61
460 SYSP,X,36:SYSP,X,14
470 NEXT
500 A=24
510 FORX=0TO2*πSTEPπ/72
520 SYSP,X2+A*SIN(X),Y2+A*COS(X)
*.85
530 NEXT
600 FORX=1TO40:PRINTD$:FORD=1TO5
0:NEXT:NEXT
```

```
ETURN
1030 IFK$="■"ORK$="■"THEN1090
1040 IFK$=CHR$(20)ORK$="■"THEN10
70
1050 IFLEN(L$)=MXOR(ASC(K$)AND12
7)<32THEN1010
1055 IFK$=" "THENK$=" "
1060 L$=L$+K$:PRINTK$"■ ■■";:GOT
01010
1070 IFL$=""THEN1010
1080 L$=LEFT$(L$,LEN(L$)-1):PRIN
TCHR$(20);:GOTO1010
1090 K$=CHR$(20):IFL$=""THEN1010

1100 FORDL=1TOLEN(L$):PRINTK$;:N
EXT:L$="":GOTO1010
2000 DIMM$(12),L(12),Z(12),Z$(12
),B(15)
2020 FORX=1TO12:READM$,L(X),Z$,Z
(X)
2030 M$(X)=CHR$(ASC(M$)+128)+MID
$(M$,2):Z$(X)=CHR$(ASC(Z$)+128)+
MID$(Z$,2)
2040 NEXT
2050 DEFFNM(X)=X+12*(X>12)
2060 S$(0)="ST":S$(1)="ND":S$(2)
="RD":S$(3)="TH"
2070 DEFFNL(X)=((X-1900)AND3)=.
2080 DEFFNM(X)=X+12*(X>12)
2090 W(0)=23:W(1)=28:W(2)=33:T=2
:FT=40:U=1:SS=1024:CS=55296:CC=6
46:PLOT=52992
2200 FORX=0TO7:READC(X):V(C(X))=
X:NEXT
2300 FORX=0TO153:READB:POKEPLOT+
X,B:NEXT
2400 E$="ABCDDDDDDDDDDDDDDDDDDABC
DDDDDDDA"
3000 PRINT"■■■"TAB(13)
3010 PRINT"■┌──────────────┐"SPC(2
6)"│ ■■■■ ■■ ■■ ■│"SPC(26)"└──
──────────┘
3020 PRINT"■■    ■ITHIN THE HUM
AN BODY, VARIOUS
3030 PRINT"     CHARACTERISTICS
 ARE KNOWN  TO
3040 PRINT"     VARY IN A  REGUL
AR MANNER OVER
3050 PRINT"     PERIODS OF TIME.

3060 PRINT"■     ■HESE  CHARACTE
RISTICS  CAN BE
3070 PRINT"     THOUGHT OF AS RE
PRESENTING THE
3080 PRINT"     LEVELS OF PHYSIC
AL, EMOTIONAL
3090 PRINT"     AND INTELLECTUAL
 ACTIVITY  AND
3100 PRINT"     ALTHOUGH NEVER
EXACTLY RIGHT,
3110 PRINT"     THEY CAN BE CALC
ULATED FOR ANY
3120 PRINT"     PERSON AT ANY TI
ME.
3130 PRINT"■     ■HIS PROGRAM WI
LL CALCULATE  A
3140 PRINT"     SET OF THESE '■
■■■■' GIVEN
3150 PRINT"     YOUR DATE OF BIR
TH.
3230 PRINT"■■■      ■RESS ■ ■■,
■■ ■ TO BEGIN...
3900 GETK$:IFK$<>CHR$(13)THEN390
0
3999 RETURN
9000 DATAJANUARY,31,CAPRICORN,20
,FEBRUARY,28,AQUARIUS,19
9010 DATAMARCH,31,PISCES,20,APRI
L,30,ARIES,20
9020 DATAMAY,31,TAURUS,20,JUNE,3
0,GEMINI,21
9030 DATAJULY,31,CANCER,23,AUGUS
T,31,LEO,23
9040 DATASEPTEMBER,30,VIRGO,23,O
CTOBER,31,LIBRA,23
9050 DATANOVEMBER,30,SCORPIO,22,
DECEMBER,31,SAGITTARIUS,21
9100 DATA0,6,2,4,5,3,7,1
9200 DATA32,128,207,132,2,32,128
,207
9210 DATA192,50,176,125,169,79,1
97,2
9220 DATA144,119,152,162,0,134,2
52,74
9230 DATA0,10,10,10,133,251,10,3
8
9240 DATA252,10,38,252,24,101,25
1,144
9250 DATA2,230,252,70,2,8,164,2
9260 DATA133,251,133,253,165,252
,72,24
9270 DATA109,136,2,133,252,104,2
4,105
9280 DATA216,133,254,177,251,162
,0,221
9290 DATA138,207,240,7,232,224,1
6,144
9300 DATA246,162,0,169,1,40,144,
1
9310 DATA10,40,144,2,10,10,134,2

9320 DATA174,52,3,240,11,202,240
,4
9330 DATA69,2,144,8,5,2,144,4
9340 DATA73,255,37,2,170,173,134
,2
9350 DATA145,253,189,138,207,145
,251,96
9360 DATA32,253,174,32,138,173,3
2,247
9370 DATA183,96,32,126,124,226,1
23,97
9380 DATA255,236,188,127,225,251
,98,252,254,160
```

SPECTRUM





THIS IS A complex draw program for the ZX Spectrum with many advanced facilities usually found only on expensive commercial packages. These include a fill routine that can handle even the most complicated shapes, patterned fill, filled-in and empty circles, solid and dotted lines, variable cursor speed, screen magnify — magnifications — and two screen stores.

To enter the program, you should first type in the control program — listing 1 — and save it to tape or Microdrive with auto-run Line 500. You should make no changes to the program, except to the Load command in line 500 if you wish to use the program on Microdrive, as memory is tight and line numbers are important. If you do not have Microdrives, then you will be unable to enter the Microdrive Save/Load lines, so type in lines 200 and 201 again in place of lines 202 and 203.

Next:

CLEAR 24999

and type in the hexloader. If you are going to use your own hexloader, then you will have to enter the Pokes and Save command at the end of the program — line 80 — yourself after you have typed the hex in. Enter the hex from the listing, eight bytes at a time with no separating spaces, entering the checksums when prompted.

When you have finished the program will automatically save the code to tape. If you want to save it to Microdrive, you must New the hexloader first, as otherwise there will not be enough memory for the "m" channel. It is best to start off by saving everything to tape, then transfer to Microdrive later.

To test the program, first type:

PRINT USR 0

to clear the computer, then Load the control program. This will automatically Load the code and print up a menu on screen. If this does not happen, press 0 then r. If you get a menu now, then you must have forgotten to enter the Pokes at the end of the hexloader. If you do not, then you have made an error in typing in the code.

The menu has six options, numbered 0-5. Option 0 allows you to use the drawing program, option 5 will quit the program and return to Basic, and the others will bring up a submenu asking what you want to save or load.

When you press 0 you should be presented with a blank screen, except for a small information window in one corner. Assuming that there was nothing in memory before you loaded the program, the screen attributes will be set to 0, so you will be unable to see your cursor. Press Caps Shift V, then select option 3 from the Clear Screen menu.

How to use the program

I will now explain how to use the program. The first thing you will need to know is how to move the cursor. The keys Q, W, E, A, D, Z, X and C are the cursor control keys — these will be familiar to users of Melbourne Draw. When used in conjunction with Symbol Shift, these keys will scroll the screen, and with Caps Shift they can be used to move the magnification window — more of which later.

The cursor can be used in any one of the four plot modes, Set — plots point, Res — resets point-equivalent to Inverse 1, XOR — inverts pixels-equivalent to Over 1 and Skip — allows you to move the cursor without plotting. These modes are selected by the keys P, O, I and U respectively.

To change the colours on the screen you must change from the pixel cursor — indicated by SCRN in the information window — to the attributes cursor — ATTR. The L key will switch between the two cursors. The attribute cursor behaves exactly like the pixel cursor, except that it is character-sized. In Set mode, it will draw with the ink, paper, bright and flash values indicated at the bottom of the information window. These can be altered using the number keys. Keys 0-7 will change the ink — unshifted — or paper — with Caps Shift — colour, keys 8 and 9 will change the bright — unshifted — and flash — with Caps Shift — values.

Note also that, when using the attribute cursor, Symbol Shift with the movement keys will scroll the attributes. It is important to remember, with both pixel and attribute cursors, that the point underneath the cursor is not plotted until you move the cursor from it. If you wish to plot/change the attributes at the cursor position, press Enter — this will plot in the current mode, so obviously will have no effect in Skip mode. Finally, on this subject, if you wish to speed up or slow down the cursor, you can use Symbol Shift together with the number keys to select a speed. There are nine speeds (1-9) and also a special "no repeat" mode (0).

For the line and circle drawing routines, you have to specify two points — these will be the two ends of the line, or of a radius of the circle. To set one end of the line, or the centre of the circle, press Caps Shift and Enter. This defines the cursor position as the "last point". Next, move the cursor to the other end of the line, or a point on the circumference of the circle.

See "last point" flashing

If you press Symbol Shift and Enter together, and hold them down, you will see the "last point" flashing. This can be useful when you wish to remind yourself of its position. To draw a line — select the appropriate mode first — it is pointless drawing a line in Skip mode! — press Caps Shift and J. To draw a circle, press Caps Shift and H. Symbol Shift and H will draw a filled circle, Symbol Shift and J gives a dotted line. To change the mask for the dotted line, press Caps Shift and K — the mask is initially set to 10101010.

It is important when drawing a picture in colour to be able to see the positions of the edges of character squares, so as to avoid "attribute clashes". To help you do so, the program can superimpose one of two grids over the screen. Press G for a black-on-white grid, or Caps Shift

DRAWER

Hex loader.

```
  1 DEF FN b(a$)=CODE a$-48-7*(a$>"9")
  2 DEF FN h(a$)=FN b(a$(1))*16+FN b(a$(2))
  3 DEF FN b$(a)=CHR$ (a+48+7*(a>9))
  4 DEF FN h$(a)=FN b$(INT (a/16))+FN b$(a-16*INT (a/16))
  5 POKE 23658,8
 10 FOR a=25000 TO 30448 STEP 8
 20 PRINT a;":";: LET c=0: LET a$=" "
 30 FOR g=0 TO 7: IF a$(1)=" " THEN INPUT LINE a$: LET a$=a$+" "
 60 LET z=FN h(a$): LET a$=a$(3 TO ): POKE a+g,z: PRINT " ";FN h$(z);:LET c=c+z
 70 NEXT g: INPUT "Checksum:";k: IF c<>k THEN PRINT '"Error": BEEP .5,50: GO TO
20
 80 PRINT : NEXT a: POKE 30456,128: POKE 30457,96: SAVE "DRAWCODE"CODE 25000,55
12
```



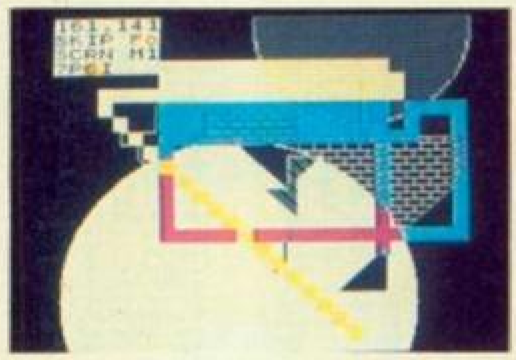
G for a grid which retains the ink and paper colours already on the screen. As the grid is a pattern of Bright and normal squares, it will not show up on an RGB monitor.

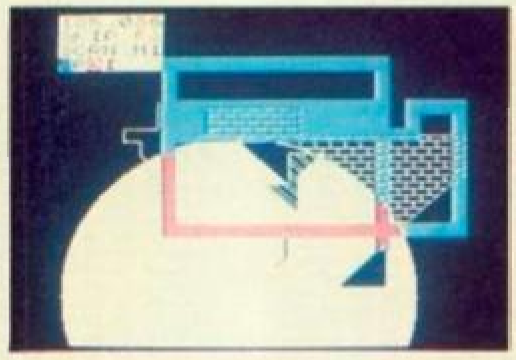
Now on to the Fill routine. This will fill in any shape bounded by a solid line or the edge of the screen. Move the cursor within the shape and press Caps Shift F. To fill a shape in with one of the 20 fill patterns, proceed as for a normal fill but press Symbol Shift F. You will be prompted for a pattern number. Select the pattern using keys 0-9 for the first 10 patterns or Caps Shift plus 0-9 for the other 10.

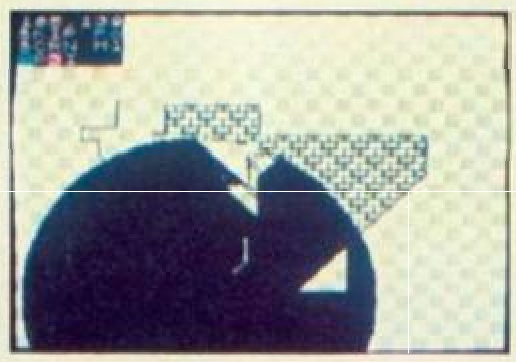
If you want to make up your own pattern, any of the 20 can be redefined. The patterns consist of an 8 by 8 character square, like a UDG. Draw your pattern in a character square — use the grid — and, with the cursor still in the square containing the pattern, press Caps Shift P. Select the pattern as for Fill. Pressing Symbol Shift with the number will abort the fill or pattern define command if you have selected it by mistake.

Similar to the "define pattern" command is "define UDG" — selected with Caps Shift and O. In answer to the "UDG?" prompt you should press the key corresponding to the graphic you want to define, which must be in the range A-U. Any other letter key or Break will abort the command.

Paul Rhodes and an advanced draw program.







There are two memory-stores for pictures, so that you can save a picture at any stage in development, then recall it if you have messed something up. To save a screen, press Caps Shift and I. To recall it later, press Caps Shift and U. The long-term store will retain the picture until you store something else over it, but Fill, Line and Circle all copy the screen into the temporary store so that you can undo their operation if needs be.

This can be especially important with Fill as you might find that you have left a gap in the shape to be filled, and fill in more than you want to; or you may decide you have chosen the wrong pattern.

There is a text mode

For putting text and UDGs on the screen, there is a Text mode, selected by pressing T. Type in text as normal, except that capital letters are unshifted and lower case shifted, using Caps Shift with the keys 5-8 to move the cursor around the screen. Graphics mode is selected with Caps Shift 9, which will change the appearance of the cursor and display "GRPH" under "Text" in the information window.

The information window now needs some explanation. The two numbers at the top are, of course, the cursor coordinates. They follow the normal practice of defining (0,0) as the bottom left corner of the part of the screen normally available to Basic. The bottom two lines are assigned negative y-coordinates. The second line of the window will display the mode — Set, Res, XOR, Skip or Text — and "Fo" which signifies that "Follow mode" is in operation — this will be explained later.

(continued on next page)

Listing 1.

```
 10 LET a=USR VAL "25383-
 20 LET o=INT (a/VAL "256"): LET b=a-VAL "256"*o
 30 IF NOT o THEN CLS : PRINT "RUN to restart": STOP
 40 INPUT n$: IF LEN n$>VAL "10" OR NOT LEN n$ THEN GO TO VAL "30"
 50 RESTORE VAL "100"+b: READ c,l: GO SUB VAL "199"+o
 60 RUN
100 DATA USR "a",VAL "168"
101 DATA VAL "30285",VAL "160"
102 DATA VAL "57344",VAL "6912"
200 SAVE n$CODE c,l: VERIFY n$CODE : RETURN
201 LOAD n$CODE c,l: RETURN
202 INPUT "Drive:";d: SAVE *"m";d;n$CODE c,l: VERIFY *"m";d;n$CODE : RETURN
203 INPUT "Drive:";d: LOAD *"m";d;n$CODE c,l: RETURN
500 CLEAR 24999: LOAD "DRAWCODE"CODE : RANDOMIZE USR VAL "25360": RUN
```

Listing 2.

```
25000: 20 00 4D 4E 42 00 4C 4B =417
25008: 4A 48 50 4F 49 55 59 30 =600
25016: 39 38 37 36 31 32 33 34 =424
25024: 35 51 57 45 52 54 41 53 =604
25032: 44 46 47 01 5A 58 43 56 =541
25040: FF 00 6D 6E 62 00 6C 6B =800
25048: 6A 68 70 6F 69 75 79 00 =776
25056: 09 08 07 06 00 00 00 00 =30
25064: 05 71 77 65 72 74 61 73 =780
25072: 64 66 67 00 7A 78 63 76 =764
25080: 20 00 2E 2C 2A 00 3D 2B =281
25088: 2D 5E 22 3B 7F 50 5B 5F =638
25096: 29 28 27 26 21 40 23 24 =326
25104: 25 20 20 20 3C 3E 7E 7C =505
25112: 5C 7B 7D 00 3A 60 3F 2F =604
25120: 00 00 00 00 DE 66 99 75 =594
25128: 51 67 88 65 D3 66 00 00 =734
25136: 00 00 00 00 BA 66 C2 66 =584
25144: BE 66 CA 66 00 00 7E 66 =820
25152: 7E 66 7E 66 7E 66 7E 66 =912
25160: 7E 66 7E 66 7E 66 7E 66 =912
25168: 7E 66 8D 65 92 65 97 65 =969
25176: 00 00 80 71 9C 65 63 6D =706
25184: A1 65 00 00 BC 67 00 00 =553
25192: A6 65 AB 65 B0 65 00 00 =816
25200: 00 00 00 00 E2 66 B2 75 =623
25208: 51 67 69 65 D3 66 EA 75 =1050
25216: BC 73 EB 72 57 70 75 70 =1029
25224: FB 6F FE 6F 00 00 7A 66 =948
25232: 7A 66 7A 66 7A 66 7A 66 =896
25240: 7A 66 7A 66 7A 66 7A 66 =896
25248: 7A 66 5C 64 61 64 66 64 =815
25256: 00 00 00 00 6B 64 39 6D =373
25264: 70 64 FE 6E C0 67 00 00 =871
25272: 75 64 7A 64 7F 64 69 6A =877
25280: 00 00 00 00 E6 66 B2 75 =627
25288: 51 67 70 65 D3 66 00 00 =710
25296: 87 73 E4 72 BA 66 C2 66 =1176
25304: BE 66 C6 66 00 00 AB 66 =865
25312: AB 66 AB 66 AB 66 AB 66 =1092
25320: AB 66 AB 66 AB 66 AB 66 =1092
25328: AB 66 9D 6D A2 6D A7 6D =1086
25336: 00 00 00 00 AC 6D DA 66 =601
25344: B1 6D 15 6F C0 67 00 00 =713
25352: B6 6D BB 6D C0 6D A5 6A =1159
25360: 11 00 E0 ED 53 2E 77 CD =931
25368: 08 70 AF 32 3B 76 32 F6 =821
25376: 76 3E 18 32 2D 77 C9 ED =856
25384: 73 FE 76 31 00 E0 CD 5A =1055
25392: 63 ED 7B FE 76 C9 3A F7 =1337
25400: 76 D3 FE CD 0D 6B CD 2E =1159
25408: 67 CD 3D 67 CD 26 64 CD =1020
25416: 04 74 3A 25 77 E6 08 20 =604
25424: 09 3A 2D 77 A7 CC 2E 67 =751
25432: 18 E7 CD A6 67 DD 21 BE =1173
25440: 63 CD 56 6B A7 28 CF FE =1162
25448: 05 01 FF 00 CB F5 CD 0D =924
25456: 6B DD 21 94 63 CD 56 6B =1003
25464: C1 4F C5 CD 0D 6B DD 21 =1048
25472: BC 63 CD B6 6B CD 62 6B =1137
25480: C1 C9 4F C9 07 03 4E 41 =827
25488: 4D 45 3F 27 11 07 53 41 =420
25496: 56 45 2F 4C 4F 41 44 27 =529
25504: 55 44 47 20 41 52 45 41 =537
25512: 27 46 49 4C 4C 20 50 41 =511
25520: 54 54 45 52 4E 53 27 53 =602
25528: 43 52 45 45 4E 27 18 0A =438
25536: 4F 50 54 49 4F 4E 53 27 =595
25544: 45 44 49 54 20 50 49 43 =546
25552: 54 55 52 45 27 53 41 56 =593
25560: 45 20 54 4F 20 54 41 50 =525
25568: 45 27 4C 4F 41 44 20 46 =498
25576: 52 4F 4D 20 54 41 50 45 =568
25584: 27 53 41 56 45 20 54 4F =537
25592: 20 4D 49 43 52 4F 44 52 =560
25600: 49 56 45 27 4C 4F 41 44 =555
25608: 20 46 52 4F 4D 20 4D 49 =522
25616: 43 52 4F 44 52 49 56 45 =606
25624: 27 45 58 49 54 20 50 52 =547
25632: 4F 47 52 41 4D 27 21 20 =478
25640: 62 3A 2B 77 A7 28 09 21 =564
25648: 70 62 3D 28 03 21 C0 62 =637
25656: DD 21 20 77 0E 08 DD 7E =774
25664: 00 06 05 1F 38 0A 23 23 =178
25672: 10 F9 DD 23 0D 20 EF C9 =1006
25680: 5E 23 56 7A B3 C8 21 2E =795
25688: 67 E5 EB E9 11 FF FF 18 =1351
25696: 21 11 00 FF 18 1C 11 01 =375
25704: FF 18 17 11 FF 00 18 12 =616
25712: 11 01 00 18 0D 11 FF 01 =328
25720: 18 08 11 00 01 18 03 11 =94
25728: 01 01 21 94 6B E3 ED 4B =829
25736: 2E 77 79 E6 1F B3 FE 20 =964
25744: D0 7B 81 4F 7A A7 28 11 =885
25752: FE 01 28 12 79 D6 20 4F =759
25760: 30 07 7B D6 08 47 FE E0 =946
25768: D8 ED 43 2E 77 C9 08 79 =1015
25776: C6 20 4F 30 F4 7B C6 08 =927
25784: 47 E6 18 FE 18 20 EA C9 =1070
25792: 7B 07 07 07 AA E6 07 AA =721
25800: 07 07 07 AA E6 FB AA C9 =1040
25808: 57 07 07 AB E6 E0 AB 5F =992
25816: 7A 37 1F 37 1F 37 1F AA =550
25824: E6 FB AA E6 FB 57 C9 7C =1538
25832: 0F 0F 0F E6 03 C6 58 67 =667
25840: C9 22 2A 77 24 7C E6 07 =793
25848: C0 7D C6 20 6F 38 05 7C =843
25856: D6 08 67 C9 7C 2F E6 18 =951
25864: C0 2A 2A 77 C9 22 2A 77 =791
25872: 25 7C 2F E6 07 C0 7D D6 =976
25880: 20 6F 38 EB 7C C6 08 67 =864
25888: C9 7D 07 07 07 AC E6 07 =756
25896: AC 07 07 07 AC E6 F8 AC =1015
25904: 57 C9 0C CB 08 D0 7D 3C =904
25912: E6 1F 28 02 2C C9 0D CB =764
25920: 00 37 C9 0D CB 00 D0 7D =805
25928: 3D 2F E6 1F 28 02 2D C9 =657
25936: 0C CB 08 37 C9 7D E6 E0 =1058
25944: 6F 7D C6 20 6F D0 7C C6 =1107
25952: 08 67 2F E6 18 C0 26 40 =706
25960: C9 2A F8 76 22 FA 76 C9 =1212
25968: CD F4 66 ED 4B FA 76 CD =1436
25976: 97 69 CD 93 69 CD 16 67 =1043
25984: 20 F1 CD 0A 67 C3 0D 6B =906
25992: 11 00 00 18 26 11 FF FF =606
26000: 18 21 11 00 FF 18 1C 11 =398
26008: 01 FF 18 17 11 FF 00 18 =599
26016: 12 11 01 00 18 0D 11 FF =345
26024: 01 18 08 11 00 01 18 03 =78
26032: 11 01 01 C1 ED 4B F8 76 =890
26040: 0A 3B 76 E6 40 28 0E 7B =706
26048: E6 1F 07 07 07 5F 7A E6 =729
26056: 1F 07 07 07 57 7B B2 FE =643
26064: C0 D0 47 7B 07 CB 12 0F =837
26072: 81 CB 12 08 CB 1A 17 AA =780
26080: E6 01 C0 08 4F 2A F8 76 =918
26088: ED 43 F8 76 4D 44 CD E6 =1250
26096: 69 C3 00 69 79 07 07 07 =547
26104: A8 E6 C7 A8 07 07 6F 3A =948
26112: 38 76 E6 40 20 16 78 A7 =812
```

(continued on next page)

(listing 2 from previous page)

```
26120: 1F 37 1F A7 1F A8 E6 F8 =961
26128: A8 67 79 E6 07 3C ED 4B =1001
26136: 3B 76 47 C9 78 07 07 EE =821
26144: 5B E6 03 EE 58 67 ED 4B =1062
26152: 3B 76 06 00 C9 3A 3B 76 =619
26160: F5 E6 8F 32 3B 76 CD 3E =1160
26168: 66 F1 32 3B 76 C9 79 07 =899
26176: 07 07 A8 E6 C7 A8 07 07 =793
26184: 4F 3A 3B 76 E6 40 20 1B =699
26192: 78 F6 07 0F 0F 0F A8 E6 =816
26200: F8 A8 67 79 E6 07 3C 47 =1008
26208: 3E FE 0F 10 FD ED 4B 3B =971
26216: 76 47 C9 78 07 07 EE F8 =1010
26224: E6 03 EE F8 67 ED 4B 3B =1193
26232: 76 C9 0E 01 18 02 0E 00 =374
26240: C5 CD 7F 67 C1 47 FE 08 =1158
26248: 38 0C 06 09 2F 00 06 7F =404
26256: 28 0E CB 08 18 0A 06 F8 =553
26264: 0D 20 05 07 07 07 06 C7 =276
26272: 4F 3A 3C 76 A9 A0 A9 32 =863
26280: 3C 76 C9 CD 7F 67 AF 26 =963
26288: 00 11 ED 76 19 7E 32 2D =618
26296: 77 C9 06 00 18 0A 06 01 =367
26304: 18 06 06 02 18 02 06 03 =75
26312: 3A 3B 76 A8 E6 FC A8 32 =1103
26320: 3B 76 C9 CD A6 67 06 40 =932
26328: 18 0E 06 80 18 0A 06 04 =216
26336: 18 06 06 10 18 02 06 08 =92
26344: 3A 3B 76 A8 32 3B 76 C5 =825
26352: 94 A8 00 00 2A 3B 76 3A =532
26360: F6 76 67 22 F2 66 F6 0B =1099
26368: 32 F6 76 7D F6 B0 32 3B =1027
26376: 76 C9 2A F2 66 7D 32 3B =939
26384: 76 7C 32 F6 76 C9 3E FE =1173
26392: 08 FE F6 E1 47 3E 7F B8 =1423
26400: FE F6 E2 A0 47 3E 81 B8 =1367
26408: FE F6 E0 A0 3C C9 CD 3A =1408
26416: A8 CD 04 74 CD 93 69 CD =1094
26424: 16 67 CB 18 F1 CD 3A 68 =960
26432: CD 04 74 CD 93 69 CD 16 =1009
26440: 67 28 F2 CD F6 68 C3 EF =1345
26448: 68 B0 21 A6 67 CD B6 68 =1061
26456: CD 62 68 CD 74 67 FE 08 =1093
26464: 30 F9 32 F7 76 D3 FE C3 =1372
26472: 0D 68 09 03 42 4F 52 44 =427
26480: 45 52 3F 27 CD CF A8 CD =977
26488: 7F 67 FE FF 28 F6 C9 ED =1463
26496: 4B 23 77 78 F6 20 06 00 =633
26504: 0F 04 30 FC 78 FE 06 D8 =915
26512: 06 08 79 F6 20 0F 05 20 =484
26520: FC 78 FE 06 30 03 3E FF =1000
26528: C9 FE 06 D8 AF C9 3A F6 =1361
26536: 76 0F B0 3F 17 32 F6 76 =841
26544: 21 00 FB 11 00 FB 01 00 =550
26552: 03 ED B0 C9 06 01 18 02 =650
26560: 06 02 3A 3B 76 E6 40 C0 =729
26568: 3A F6 76 21 00 A8 E5 E6 =1034
26576: 01 20 03 C5 21 00 FB 11 =739
26584: 00 FB 01 00 03 ED B0 3A =726
26592: F6 76 F6 01 32 F6 76 C1 =1218
26600: 05 20 26 21 01 FB 11 02 =376
26608: FB 36 38 2B 36 78 01 1E =606
26616: 00 ED B0 23 ED A0 3E 00 =891
26624: 01 1F 00 ED B0 21 00 F8 =726
26632: 11 40 F8 01 C0 02 ED B0 =937
26640: C9 21 00 F8 11 00 40 01 =564
26648: 18 10 7E E6 8F B2 77 23 =919
26656: 7E E6 8F B3 77 23 10 F2 =1138
26664: 06 10 7A 53 5F 0D 20 EA =601
26672: C9 CD B6 68 DD 7E 00 06 =1253
26680: 04 47 4B E5 CD 62 68 E1 =1008
26688: CD 59 65 CD 59 65 E5 79 =1140
26696: 90 C6 30 CD 72 68 2C CD =1062
26704: 62 68 E1 10 EE C9 CD 31 =1136
26712: 68 C5 CD 74 67 C1 B9 D8 =1319
26720: 18 F7 3E 47 08 DD 23 DD =889
26728: 7E 00 FE 27 C8 CD 72 68 =1042
26736: 18 F3 C5 E5 6F 26 00 29 =887
26744: 29 29 11 00 3C 19 EB E1 =644
26752: E5 CD 8F 68 25 CD E7 64 =1254
26760: 08 77 08 E1 2C C1 C9 06 =804
26768: 08 1A 77 24 13 10 FA C9 =675
26776: 06 08 43 4C 45 41 52 27 =416
26784: 4E 4F 4E 45 27 53 43 52 =575
26792: 45 45 4E 27 41 54 54 52 =570
26800: 27 42 4F 54 48 27 0D 46 =670
26808: 00 0D 4E 01 04 04 21 00 =341
26816: 40 3E 70 08 3E 23 CD 72 =662
26824: 68 10 F9 CD 55 65 3E 23 =857
26832: CD 72 68 3E 47 08 DD 46 =855
26840: 00 3E 20 CD 72 68 10 F9 =782
26848: 3E 70 08 3E 23 CD 72 68 =702
26856: CD 55 65 0D 20 E0 DD 46 =951
26864: 00 04 04 3E 23 CD 72 68 =528
26872: 10 F9 21 42 40 DD 23 C9 =885
26880: 3A 3B 76 E6 20 C4 97 69 =949
26888: 3A 3B 76 E6 04 CA C6 69 =974
26896: CD 23 69 08 CD 57 69 D8 =1174
26904: 3A 3B 76 E6 08 CA 05 6A =786
26912: C3 2D 6A 2A 2E 77 CD 21 =791
26920: 65 7D 07 07 07 E6 F8 5F =820
26928: 79 93 38 50 07 4F 0F 0F =520
26936: 0F 0F E6 1F 2A 3B 76 BD =696
26944: 30 42 7B 92 38 3E BC 30 =734
26952: 38 07 47 3A 3B 76 E6 08 =610
26960: C8 C8 00 CB 01 A7 C9 3A =1033
26968: F6 76 E6 08 C0 C5 2A 02 =1035
26976: 74 CD 21 65 7B 92 38 19 =802
26984: FE 20 30 15 7D E6 1F 07 =748
26992: 07 07 4F 79 95 38 E0 FE =929
27000: 38 30 06 CD 99 75 C1 37 =833
27008: C9 C1 A7 C9 3A 3B 76 E6 =1227
27016: 80 37 C0 CD 63 6D CD 16 =1015
27024: 75 37 C9 ED 4B F8 76 ED =1288
27032: 5B 3B 76 3A F6 76 E6 04 =924
27040: C2 DF 70 78 EE 20 E6 FC =1404
27048: F6 01 32 3B 76 D5 3E 3F =812
27056: 32 3C 76 C5 CD 08 69 C1 =936
27064: D1 3A 3B 76 A8 E6 FC A8 =1268
27072: 5F ED 53 3B 76 C9 CD 57 =1085
27080: 69 D8 CD F4 65 79 E6 40 =1286
27088: 20 22 3E FE 0F 10 FD 47 =737
27096: 7E CB 41 20 01 A0 CB 49 =863
27104: 20 02 A8 2F 77 C9 C5 CD =971
27112: 3E 66 CD EF 69 C1 C9 79 =1228
27120: E6 40 28 E4 3A 3C 76 47 =869
27128: 7E CB 41 20 01 AF CB 49 =878
27136: 20 01 A8 77 C9 CD F4 65 =1071
27144: 79 E6 40 20 0F 3E 7E 0F =665
27152: 10 FD 47 CD D8 69 47 CD =1142
27160: F1 64 70 C9 7D E6 DE AF =1342
27168: CD F4 69 23 77 11 20 00 =757
27176: 19 77 20 77 C9 CD F4 65 =1059
27184: 79 E6 40 20 13 3E 1E 0F =573
27192: 10 FD 47 CD D8 69 06 03 =875
27200: 4F CD F1 64 71 10 F8 C9 =1205
27208: 7D E6 9C AF CD F4 69 01 =1177
27216: 03 00 5D 54 13 3E 04 E5 =494
27224: ED B0 D1 21 20 00 19 EB =947
27232: D5 01 04 00 3D 20 F1 D1 =761
27240: C9 DD 21 98 68 CD 56 68 =1106
27248: 21 0D A8 E5 A7 CB 3D 28 =850
27256: 06 3D 28 11 CD 8D 6A 21 =609
27264: 00 E0 11 01 E0 01 FF 17 =745
27272: 36 00 ED B0 C9 21 00 FB =949
27280: 11 01 FB 3A 3C 76 77 01 =622
27288: FF 02 ED B0 3A F6 76 E6 =1322
27296: FE 32 F6 76 C9 DD 21 EE =1361
27304: 6A CD 56 68 21 00 68 E5 =883
27312: A7 CB 3D 28 06 3D 28 13 =594
27320: CD CB 6A 21 00 E0 01 00 =772
27328: 18 7E 2F 77 23 0B 78 B1 =659
27336: 20 F7 C9 CD A6 67 21 00 =987
27344: FB 01 00 03 7E 5F 0F 0F =503
27352: 0F A8 E6 07 A8 57 7B 07 =811
27360: 07 07 AA E6 38 AA 77 23 =794
27368: 0B 78 B1 20 E7 C9 06 08 =790
27376: 49 4E 56 45 52 54 27 4E =589
27384: 4F 4E 45 27 53 43 52 45 =566
27392: 45 4E 27 41 54 54 52 27 =540
27400: 42 4F 54 48 27 3A 3B 76 =575
27408: E6 DF 32 3B 76 47 E6 04 =985
27416: 28 14 78 21 00 40 ED 5B =605
27424: 3E 77 ED 4B 3B 76 E6 08 =889
27432: C6 C0 AC C3 3A AC 21 00 =892
27440: E0 11 00 40 01 00 18 ED =570
27448: B0 C9 3A 3B 76 E6 14 FE =1116
27456: 10 C0 2A 2E 77 CD E7 64 =951
27464: E5 3A 37 76 77 3A 3B 76 =814
27472: E6 08 01 0F 00 28 03 01 =298
27480: 07 00 5D 54 13 ED B0 E1 =841
27488: 3A 3B 76 E6 08 01 10 08 =501
27496: 28 03 01 08 05 C5 E5 11 =500
27504: 20 00 EB 19 EB 06 00 ED =770
27512: B0 E1 11 20 00 19 C1 10 =684
27520: EC 3A 37 76 4F C6 03 A9 =916
27528: E6 07 A9 D6 0B E6 5F 32 =971
27536: 37 76 AF C9 3A 3B 76 E6 =1014
27544: 08 01 10 60 28 03 01 08 =173
27552: 30 ED 43 3B 76 ED 5B 3E =900
27560: 77 7B E6 1F 3D B1 FE 20 =979
27568: 38 07 7B E6 E0 C6 20 91 =1015
27576: 5F CD C0 64 B0 3D FE C0 =1227
27584: 38 06 3E C0 90 CD B0 64 =973
27592: ED 53 3E 77 C3 0D 68 CD =1005
27600: 0F AC CD F6 A8 CD 1C AC =1022
27608: CB CD F6 68 3A 20 77 57 =1054
27616: E6 FD 32 20 77 AA 5F 3A =1007
27624: 27 77 57 E6 FE 32 27 77 =937
27632: AA B3 32 28 77 C9 CD 93 =1111
27640: 69 3A 2D 77 A7 CB AF 3A =863
27648: F6 76 E6 04 28 03 2A 2C =727
27656: 77 10 FE 2D 20 FB C9 21 =951
27664: 20 77 11 21 77 01 07 00 =328
27672: 36 1F ED B0 21 20 77 01 =683
27680: FE 7F 1E 00 ED 78 2F A6 =981
27688: 77 B3 5F 23 CB 08 38 F4 =939
27696: 78 32 28 77 A7 C9 E5 D5 =1142
27704: C5 C5 D5 E5 41 C5 D5 1A =1337
27712: 4F 06 04 CB 11 9F 5F CB =766
27720: 11 9F A8 E6 0F A8 77 23 =917
27728: 10 F1 D1 13 C1 10 E6 E1 =1149
27736: 06 03 C5 E5 50 54 14 06 =638
27744: 00 CB 21 CB 21 ED B0 E1 =1110
27752: 24 C1 10 EE CD F1 64 EB =1264
27760: E1 CD F1 64 EB C1 10 C1 =1408
27768: C1 E1 CD E7 64 CA A0 57 =1399
27776: 5D E1 CD E7 64 CB 38 CB =1316
27784: 38 CB 38 CB 21 CB 21 C5 =984
27792: D5 E5 41 1A 77 23 77 23 =841
27800: 77 23 77 23 13 10 F4 06 =593
27808: 03 E1 C5 11 20 00 EB 19 =734
27816: E5 EB 06 00 ED B0 CB 38 =1142
27824: E1 C1 10 EE 11 20 00 19 =746
27832: EB C1 09 EB C1 10 B0 C9 =1290
27840: E5 D5 C5 C5 E5 D5 E5 41 =1572
27848: D5 C5 1A 4F 06 04 4F CB =903
27856: 01 17 17 10 FA 5F 0F B3 =602
27864: 77 23 06 04 AF CB 01 17 =566
27872: 17 10 FA 5F 0F B3 77 23 =732
27880: C1 D1 1C 10 D8 E1 5D 54 =1067
27888: 14 CB 21 ED B0 E1 CD F1 =1340
27896: 64 EB E1 24 CD F1 64 C1 =1335
27904: 10 C1 C1 E1 CD E7 64 C6 =1361
27912: A0 57 5D E1 CD E7 64 78 =1221
27920: 0F 0F 0F E6 1F 47 C5 E5 =803
27928: D5 41 C5 01 20 00 1A 77 =653
27936: 09 77 2C 77 ED 42 77 2C =757
27944: 1C C1 10 EE E1 0E 20 09 =755
27952: EB E1 0E 40 09 C1 10 0E =970
27960: C9 2A 2E 77 CD 21 65 7D =872
27968: 07 07 07 E6 F8 5F 3A 3B =711
27976: 76 21 20 18 E6 08 20 01 =478
27984: 29 19 ED 4B F8 76 22 F8 =1026
27992: 76 3A 3B 76 E6 20 C8 C3 =1010
28000: 97 69 C9 ED 4B F8 76 3A =1193
28008: 3B 76 E6 08 28 14 79 D6 =810
28016: 1F 30 01 AF E6 F8 4F 78 =932
28024: D6 17 30 01 AF E6 F8 47 =1010
28032: 18 12 79 D6 3F 30 01 AF =664
28040: E6 F8 4F 78 D6 2F 30 01 =987
28048: AF E6 F8 47 CD 2D 66 22 =1110
28056: 2E 77 C3 94 6B 11 FF FF =1142
28064: 18 21 11 00 FF 18 1C 11 =398
28072: 01 FF 18 17 11 FF 00 18 =599
28080: 12 11 01 00 18 0D 11 FF =345
28088: 01 18 08 11 00 01 18 03 =78
28096: 11 01 01 21 00 A8 E3 D5 =612
28104: 3A 3B 76 E6 40 28 72 7A =805
28112: A7 28 3B F2 F3 AD 21 00 =893
28120: FB 11 00 77 01 20 00 ED =654
28128: B0 11 00 FB 01 E0 02 ED =905
28136: B0 21 00 77 01 20 00 ED =598
28144: B0 18 1B 21 FF FA 11 1F =813
28152: 77 01 20 00 ED B8 11 FF =845
28160: FA 01 E0 02 ED B8 21 1F =962
28168: 77 01 20 00 ED B8 D1 7B =905
28176: A7 CB F2 28 AE 21 01 FB =1044
28184: 11 00 FB 06 18 C5 1A 01 =519
28192: 1F 00 ED B0 12 23 13 C1 =709
28200: 10 F3 C9 21 FE FA 11 FF =1269
28208: FA 06 18 C5 1A 01 1F 00 =535
28216: ED B8 12 1B 2B C1 10 F3 =961
28224: C9 7A A7 28 53 F2 71 6E =1078
28232: 21 00 E0 11 00 77 01 20 =426
28240: 00 ED B0 21 00 E1 11 00 =688
28248: E0 E5 01 20 00 ED B0 D1 =1108
28256: 68 62 CD F1 64 20 F2 21 =1058
28264: 00 77 01 20 00 ED B0 18 =589
28272: 27 21 FF F7 11 1F 77 01 =742
28280: 20 00 ED B8 11 FF F7 21 =1005
28288: FF F6 E5 01 20 00 ED B8 =1184
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(continued from previous page)

The third line displays the cursor mode — SCRN or ATTR for the normal cursor, GRPH or nothing for the text cursor — and the magnification — so far, always 1. Along the bottom are the paper and ink colours and bright and flash settings — a bright B appears for Bright 1, a flashing F for Flash 1. The window can be turned off and on with Caps Shift N, and it can be moved by pressing N. This is normally unnecessary as it moves automatically if you move the cursor over it. So as to be noticeable at all times when switched on, the window selects black or white paper to contrast with the paper colour underneath it.



One of the most important and useful features of the program is the magnifier. This allows you to magnify part of the screen by a factor of either two or four in each direction — i.e., magnifying the area by four or 16. The area to be magnified is called the "magnification window" and can be seen by pressing Caps Shift and M — press them again to turn it off. It can be moved around the screen by pressing Caps Shift along with the cursor movement keys. Symbol Shift M will select the magnification and hence the size of the window — with a greater magnification, the area to be magnified is smaller.

To magnify the area in the window, press M. There is a special feature of the magnifier which causes the window to automatically centre itself on the cursor if it is not within the magnification window. This means that when drawing in magnified mode, the window will automatically follow the cursor when it goes off the edge of the screen and is therefore called "Follow mode".

You can turn it off — and back on again — by pressing Symbol Shift and S. To centre the window press S, and to move the cursor to the centre of the window, press Caps Shift and S. You can still change the magnification and move the window around when in magnified mode, but remember that in follow mode you cannot move the window away from the cursor.

To clear the screen, press Caps Shift and V, then select either screen which will leave the attributes alone, attributes which will clear the colour details only or both — a normal CLS.

Symbol Shift and V will select the Invert command, which has the same options available. This can be useful for many things. For example, for inverted text you should invert the screen, then put the text on the screen normally, then invert the screen again.

You can also clear parts of the screen by inverting the screen, drawing round them and filling them in, and then inverting the screen again. Note that the option to invert both screen and attributes will have no visible effect, unless you turn the grid on. One other command which can be used in conjunction with Clear is Border — press B — which can be used to set the border colour. This does not affect the picture itself, it is purely for the convenience of the user.

The only other key which you will need to use is R. Regardless of any shifts, this will return you to the main Save/Load menu.

I think you will find that it is worth the time and effort to type it in. Alternatively, as usual, I can supply it on tape for £3 — with instructions for transference to Microdrive. Orders to P. Rhodes at 104 Ventor Gardens, Luton LU3 3SW. ■

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28296: E1 5D 54 CD 0D 65 20 F2 =995
28304: 21 1F 77 01 20 00 ED B8 =637
28312: D1 7B A7 CB F2 B9 6E 21 =1269
28320: 1F E0 06 C0 C5 E5 06 20 =917
28328: CB 16 2B 10 FB E1 CB 1E =993
28336: CB 06 CD F1 64 C1 10 EC =1200
28344: C9 21 00 E0 06 C0 C5 E5 =1082
28352: 06 20 CB 1E 23 10 FB E1 =798
28360: CB 16 CB 0E CD F1 64 C1 =1181
28368: 10 EC C9 7B B6 77 7C F6 =1244
28376: E0 67 7B A3 B6 77 7C E6 =1265
28384: 5F 67 C9 7B A6 C9 3A FF =1199
28392: BF FE FF C0 79 0F 0F 0F =1058
28400: AC E6 E0 AC 08 7D D9 6F =1259
28408: 08 67 E3 E5 D9 C9 21 00 =1018
28416: 3C 18 18 11 03 50 41 54 =357
28424: 54 45 52 4E 20 4E 55 4D =585
28432: 42 45 52 3F 27 CD 32 70 =686
28440: DA 0D 6B 22 FC 76 D9 E5 =1188
28448: CD F4 66 21 FF FF 22 FE =1382
28456: BF E5 AF 32 3B 76 CD 0B =1038
28464: 70 ED 4B FB 76 CD F4 65 =1340
28472: 4B 0D 3E 01 0F 10 FD 47 =503
28480: 7C E6 07 ED 5B FC 76 B3 =1190
28488: 5F 7A CE 00 57 1A 5F 1A =653
28496: 00 CD 43 65 38 08 CD E3 =869
28504: 6E 28 F6 CD 32 65 CD D3 =1168
28512: 6E CD F1 64 28 10 CD E3 =1144
28520: 6E 28 04 CB 8A 18 07 CB =729
28528: 4A CC E6 6E CB CA 2A 2A =1107
28536: 77 CD 0D 65 28 10 CD E3 =926
28544: 6E 28 04 CB 82 18 07 CB =721
28552: 42 CC E6 6E CB C2 2A 2A =1091
28560: 77 CD 32 65 38 05 CD E3 =968
28568: 6E 28 C3 E1 7C E6 E0 07 =1155
28576: 07 07 4F 3C 47 7C E6 1F =609
28584: F6 40 67 FE 58 38 8B CD =1155
28592: 0A 67 E1 D9 C3 00 AB 13 =889
28600: 06 53 54 4F 52 45 2F 52 =532
28608: 45 54 52 49 45 5A 45 27 =571
28616: 54 45 40 50 4F 52 41 52 =618
28624: 59 20 53 54 4F 52 45 27 =557
28632: 4C 4F 4E 47 20 54 45 52 =571
28640: 4D 20 53 54 4F 52 45 27 =545
28648: DD 21 B7 6F CD 56 6B 2E =989
28656: 00 0F 0F 0F CA B0 67 C9 =675
28664: CD EB 6F EB 18 10 CD EB =1260
28672: 6F 3A F6 76 E6 FE 32 F6 =1313
28680: 76 18 1C 11 00 80 21 00 =348
28688: E0 01 00 18 ED B0 3A F6 =966
28696: 76 E6 01 01 00 03 28 0D =406
28704: 26 FB 18 09 21 00 40 11 =436
28712: 00 E0 01 00 1B ED B0 C3 =860
28720: 0D AB DD 21 03 6F CD B6 =875
28728: 6B CD 62 6B CD 74 67 87 =1070
28736: 87 87 6F 26 00 3A 2B 77 =636
28744: FE 02 3F D8 A7 11 4D 76 =914
28752: 2B 03 11 9D 76 19 C9 CB =766
28760: 32 70 DA 0D 6B E5 ED 4B =1041
28768: FB 76 CD 2D 66 7C E6 FB =1320
28776: 67 D1 06 08 7E 12 13 24 =525
28784: 10 FA C3 0D AB DD 21 A0 =995
28792: 70 CD B6 6B CD 62 6B CD =1215
28800: 2E 67 CD 3D 67 CD A7 70 =1002
28808: E6 DF D6 41 38 F4 FE 15 =1307
28816: D2 0D 6B 26 00 87 87 87 =773
28824: 6F ED 5B 7B 5C 19 18 B0 =892
28832: 06 03 55 44 47 3F 27 11 =352
28840: AB 61 3A 2B 77 A7 28 09 =698
28848: 11 D0 61 3D 28 03 11 FB =691
28856: 61 21 20 77 06 05 0E 08 =314
28864: CB 1E 38 08 13 10 F9 23 =619
28872: 0D 06 05 20 F3 AF C9 1A =701
28880: C9 3A F6 76 E6 FB 32 F6 =1400
28888: 76 3A 3B 76 E6 20 C8 3A =873
28896: 3B 76 EE 20 32 3B 76 E6 =904
28904: 20 DD 21 00 A0 28 0F 3A =559
28912: F6 76 E6 02 DD 21 3D 76 =1029
28920: 28 04 DD 21 45 76 3A 3B =602
28928: 76 ED 4B FB 76 E6 04 20 =1062
28936: 09 CD F4 65 DD E5 D1 C3 =1413
28944: 8F 6B CD 23 69 D8 28 36 =902
28952: CD F4 65 06 08 C5 DD 5E =1076
28960: 00 06 04 C5 CB 03 9F 4F =651
28968: CB 03 9F A9 E6 0F A9 06 =954
28976: 04 77 24 10 FC 7C D6 04 =769
28984: 67 C1 2C 10 E6 C1 DD 23 =1035
28992: 7D D6 04 6F 7C C6 04 67 =883
29000: CD F6 64 10 D0 C9 CD F4 =1425
29008: 65 06 08 C5 DD 4E 00 DD =832
29016: 23 06 04 AF CB 11 17 17 =486
29024: 10 FA 47 0F B0 77 06 04 =657
29032: AF CB 11 17 17 10 FA 47 =778
29040: 0F B0 4E 2C 77 24 77 2D =632
29048: 71 CD F1 64 C1 10 D4 C9 =1281
29056: 3A 3B 76 07 07 D8 07 DC =692
29064: 93 69 3A F6 76 F6 04 32 =974
29072: F6 76 ED 4B FB 76 7B E6 =1392
29080: FB 47 79 E6 FB 4F ED 43 =1301
29088: FB 76 CD 20 72 CD 2E 67 =1071
29096: 3E 10 32 2C 77 CD CF 6B =810
29104: CD A7 70 FE FF CA D1 70 =1516
29112: A7 28 ED CD D1 71 3A 2C =1073
29120: 77 D6 18 38 08 FE 20 30 =755
29128: E1 3E 20 18 0D 3E 50 18 =730
29136: D9 F5 CD D9 70 F1 FE 20 =1523
29144: 3B 56 6F 26 00 3A F6 76 =713
29152: E6 02 ED 5B 3A 5C 28 12 =764
29160: 7D FE 20 28 0D FE 41 D8 =999
29168: FE 56 D0 D6 41 6F ED 5B =1266
29176: 7B 5C 29 29 29 19 E5 ED =829
29184: 4B FB 76 CD 2D 66 D1 D5 =1215
29192: CD 8F 6B DD E1 ED 4B FB =1458
29200: 76 79 C6 08 4F 78 47 C5 =912
29208: CD FE 70 C1 ED 43 FB 76 =1434
29216: CD 2D 66 11 00 A0 01 08 =538
29224: 00 7E 12 24 13 10 FA C9 =666
29232: DD 21 00 A0 FE 09 20 08 =720
29240: 3A F6 76 EE 02 32 F6 76 =1076
29248: C3 2E 67 FE 05 D8 ED 4B =1131
29256: FB 76 20 05 79 D6 08 18 =770
29264: C3 FE 08 28 BC FE 07 78 =1066
29272: 20 08 D6 08 30 B8 D6 40 =772
29280: 18 B4 C6 08 FE C0 38 AE =1086
29288: D6 C0 18 AA C5 3A 08 77 =982
29296: 90 ED 43 07 77 32 07 77 =750
29304: CD B4 72 C1 79 4B 47 91 =1053
29312: CB 32 07 77 11 00 00 C5 =590
29320: CD 95 72 C1 7B A7 CB 11 =1165
29328: 00 FF ED 44 47 3A 29 77 =849
29336: A7 20 2A C5 D5 CD A9 72 =1139
29344: D1 C1 79 A7 CB ED 44 4F =1274
29352: 1D 2A FA 76 7C 80 47 9F =921
29360: AA C0 7B FE C0 D0 7D 81 =1390
29368: 4F 9F AB C0 C5 CD 08 69 =1116
29376: C1 CD E6 69 C9 3A 07 77 =1118
29384: A7 CB 79 A7 28 DB C5 D5 =1324
29392: CD A9 72 D1 C1 C5 D5 1D =1329
29400: 79 ED 44 4F CD A9 72 D1 =1202
29408: C1 0D 18 E1 3E FF 18 01 =797
29416: AF 32 29 77 CD 0B 70 CD =918
29424: F4 66 ED 4B FB 76 2A FA =1316
29432: 76 7B 94 30 02 ED 44 F5 =986
29440: 79 95 30 02 ED 44 CD 60 =926
29448: 73 F1 E5 CD 60 73 D1 19 =1235
29456: CD 74 73 7C A7 20 46 7A =951
29464: B3 28 01 2C DD 21 00 77 =637
29472: 7D DD 77 00 A7 20 08 01 =673
29480: 00 00 CD A9 72 18 2E 11 =575
29488: B5 00 CD A3 73 7C DD 77 =1064
29496: 01 DD 7E 01 CD 60 73 E5 =994
29504: DD 7E 00 CD 60 73 C1 A7 =1123
29512: ED 42 CD 74 73 45 DD 4E =1107
29520: 01 CB 6C 72 DD 7E 01 DD =997
29528: 35 01 A7 20 DC C3 0A 67 =781
29536: 5F 16 00 21 00 00 06 08 =164
29544: CB 3F 30 01 19 CB 23 CB =781
29552: 12 10 F5 C9 11 01 00 A7 =665
29560: ED 52 38 04 13 13 18 F7 =688
29568: 19 CB 3A CB 1B EB C9 3A =1010
29576: 3A 76 18 02 3E FF 6F D9 =847
29584: E5 CD 0B 70 CD F4 66 2A =1150
29592: FA 76 ED 4B FB 76 11 01 =1064
29600: 01 7B 94 28 05 30 04 ED =603
29608: 44 15 15 47 79 95 28 05 =496
29616: 30 04 ED 44 1D 1D 4F B0 =670
29624: 28 42 79 B8 D5 38 06 16 =708
29632: 00 6B 41 18 03 1E 00 69 =331
29640: 60 D9 ED 4B FA 76 D9 78 =1330
29648: CB 3F B5 38 03 BC 38 07 =709
29656: 94 4F D9 D1 D5 18 04 4F =973
29664: D5 D9 D1 7A B0 47 79 B3 =1212
29672: 4F CB 0D 30 0A E5 C5 CD =984
29680: 08 69 C1 CD E6 69 E1 D9 =1288
29688: 79 10 D7 D1 CD 0A 67 E1 =1104
29696: D9 C9 00 40 2A 02 74 3A =700
29704: 3B 76 E6 04 28 03 2A 97 =647
29712: 65 CD E7 64 7C F6 E0 67 =1334
29720: 7E E6 20 3E 07 20 02 3E =553
29728: 38 21 53 75 11 00 98 01 =462
29736: 1C 00 ED B0 EB 11 1D 98 =877
29744: 77 01 1B 00 ED B0 AF 0F =686
29752: 0F 0F AD E6 07 AD 6F 67 =827
29760: 22 35 9B 22 2B 9B EE 06 =715
29768: 32 30 9B 21 00 9B ED 4B =753
29776: FB 76 C5 79 0E 03 CD 7F =1033
29784: 75 23 C1 3E AF 90 0E 03 =743
29792: 30 06 ED 44 3A 2D 23 0D =506
29800: CD 7F 75 3A F6 76 E6 04 =1105
29808: 20 05 3A 3B 76 E6 03 07 =512
29816: 07 EB AF 26 00 01 3F 75 =572
29824: 09 01 04 00 ED B0 11 0E =458
29832: 9B 3A F6 76 E6 06 FE 04 =1071
29840: 30 0B 3A 3B 76 E6 40 07 =592
29848: 07 07 07 6F 26 00 01 6F =282
29856: 75 09 01 04 00 ED B0 3A =602
29864: 3B 76 07 3B 0B 2A 2B 9B =488
29872: 7C EE 05 AF 67 22 2B 9B =810
29880: 3A 3C 76 47 E6 07 C6 30 =790
29888: 32 17 9B E6 07 FE 04 17 =746
29896: 0F 07 17 0F 07 17 32 33 =191
29904: 9B 78 E6 38 FE 20 30 02 =897
29912: F6 07 32 31 9B 0F 0F 0F =552
29920: E6 07 C6 30 32 15 9B CB =912
29928: 00 30 08 3A 36 9B EE 87 =696
29936: 32 36 9B CB 00 30 08 3A =576
29944: 35 9B EE 47 32 35 9B 3A =833
29952: 3B 76 2E 32 E6 0C FE 08 =777
29960: 38 02 2E 34 E6 04 20 02 =424
29968: 2E 31 7D 32 14 9B 3A F6 =749
29976: 76 E6 10 C0 2A 02 74 DD =937
29984: 21 00 9B 01 04 07 E5 C5 =626
29992: DD 7E 1C 08 DD 7E 00 CD =935
30000: 72 6B DD 23 10 F3 C1 E1 =1150
30008: CB 59 65 0D 20 EB C9 53 =956
30016: 45 54 20 5B 4F 52 20 52 =548
30024: 45 53 20 53 4B 49 50 54 =579
30032: 45 5B 54 20 20 20 2C 20 =413
30040: 20 20 20 20 20 20 20 46 =294
30048: 6F 20 20 20 20 20 4D 20 =380
30056: 20 50 20 49 42 46 20 53 =468
30064: 43 52 4E 41 54 54 52 20 =574
30072: 20 20 20 47 52 50 4B E5 =630
30080: 06 00 21 95 75 09 5E E1 =633
30088: 06 2F 93 04 30 FC 83 70 =747
30096: 23 0D 20 EB C9 00 01 0A =527
30104: 64 2A 02 74 7C FE 40 20 =734
30112: 05 21 B0 50 18 03 21 00 =306
30120: 40 22 02 74 CD 0D AB C3 =736
30128: 16 75 3A F6 76 EE 10 32 =865
30136: F6 76 18 F0 0D 07 44 52 =798
30144: 41 57 20 4B 41 53 4B 27 =523
30152: 52 45 53 45 54 20 42 49 =558
30160: 54 27 53 45 54 20 42 49 =530
30168: 54 27 27 20 2A 2A 2A 2A =362
30176: 2A 2A 2A 2A 27 27 DD 21 =500
30184: BC 75 CD 31 6B 21 C2 40 =954
30192: E5 CD 65 6B 3E 87 32 C3 =1081
30200: 5B E1 2C 06 08 C5 E5 CD =1002
30208: 2E 67 CD 74 67 FE 02 30 =877
30216: F6 6F 07 07 F6 43 08 3E =754
30224: 30 B5 E1 CD 72 6B E5 CD =1263
30232: E7 64 36 87 E1 C1 10 DD =1175
30240: 06 08 21 C3 5B 7E 23 E6 =721
30248: 04 0F 0F 0F CB 11 10 F5 =530
30256: 79 32 3A 76 C3 00 A8 03 =665
30264: 08 2B AA 00 07 FF 81 81 =738
30272: 99 99 81 81 FF 81 7E A6 =1176
30280: 5A 5A A6 7E 81 55 AA 55 =877
30288: AA 55 AA 55 AA AA 00 AA =1020
30296: 00 AA 00 AA 00 FF 00 FF =850
30304: 00 FF 00 FF 00 88 11 22 =697
30312: 44 88 10 20 40 21 90 48 =565
30320: 24 12 09 84 42 AA AA 44 =669
30328: 44 AA AA 11 11 EE 22 33 =765
30336: 99 EE 22 33 99 B0 B0 B0 =1013
30344: FF 08 08 08 FF 88 44 22 =772
30352: 22 22 44 88 88 22 50 88 =658
30360: 05 22 50 88 05 08 04 7C =396
30368: A4 25 3E 20 10 43 A5 5A =633
30376: 34 2C 5A A5 C2 55 55 55 =800
30384: 55 55 55 55 55 CC CC 33 =884
30392: 33 CC CC 33 33 38 70 E0 =953
30400: C1 83 07 0E 1C 22 FA BA =795
30408: AA AA AA AB AF E5 07 3B =1145
30416: AB BA B3 E0 A7 8B 55 22 =1134
30424: 11 44 22 55 88 08 1C 3E =438
30432: 7F FF 7F 3E 1C A0 BE 82 =1079
30440: FA 0A EB 2B AF 00 01 08 =719
30448: 10 18 20 30 40 50 00 00 =264
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GRAPHICS

AMSTRAD

Andrew Ware with a suite of 13 new graphics commands for the CPC-464.

THIS PROGRAM gives you 13 extra graphics commands. The Inverse and Copychar commands are text-orientated and the others are graphics orientated. The Stipple command affects both graphics and text. After the Ston command has been used all text is stippled as well as all points plotted, all lines drawn and all shapes filled. When using stippled text no text will be printed when the graphics pen and paper are equal since the graphics Tag mode is used to print the text.

Any stippled text may be fully edited provided that the background colour does not appear within the stipple parameters. The Stoff command will return the text and graphics to their original pen and paper colours. If the Paint command is used while the stipple effect is on unpredictable patterns will occur due to the order in which points are plotted. To fill a shape with stipple I would advise the use of the Box, Ellipse and Circle commands with the Fill command on.

Any colour parameters used refer to the pen and paper colours currently selected and will respond to mode changes in the same manner as does Amstrad Basic. For example, if the stipple colours are selected by:

STIPPLE,1,2,3,4,5,6,7,8

then in mode 0 all eight colours will be used, however in mode 1 these colours will appear Mod 4 and the stipple will be equivalent to:

STIPPLE,1,2,3,4,0,1,2,3,0

If the incorrect number of parameters for a command have been entered the routine will return to Basic and display an error message.

Type in the data from program 3 followed by program 1. Once program 1 has been run the code can be saved by:

SAVE"CALL 38155",B,37985,2220

To load this data type:

MEMORY 37985:LOAD"CALL 38155"

and to use the new commands type:

CALL 38155

Remember that if you wish to use the Symbol After command it must be used before the Memory command.

|BOX,x co-ordinate,y co-ordinate,width, height [,ink]. This command responds to FILL. With |FILL,0 an outline of the box is drawn and with |FILL,1 the box is filled.

|CIRCLE,x co-ordinate,y co-ordinate,radius [,ink]. Circle responds to FILL. With |FILL,0 the circumference only is drawn and with |FILL,1 the circle is filled.

|COPYCHAR,column,row,@variable%. Returns the CHR$ value of the character at the given row and column position into the integer variable following the "@" character.

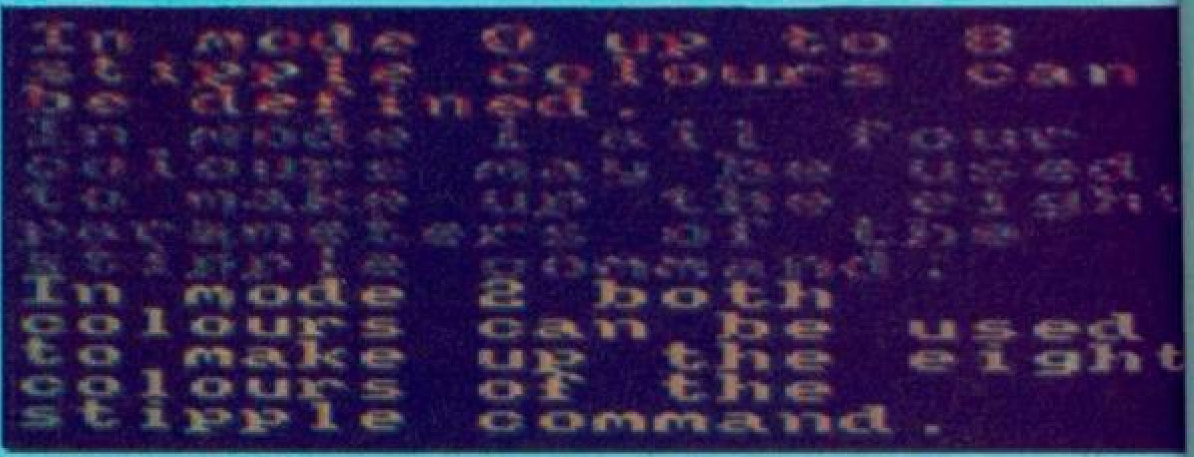
|ELLIPSE,x co-ordinate,y co-ordinate,width, height [,ink]. Ellipse responds to FILL in the

Program 1.

```
10 DEG:FOR F=Ø TO 255:POKE (156*256)+F,SIN(F/255*18Ø)*
255:NEXT
```

Program 3.

```
1Ø REM Hex loader
2Ø REM use this program to enter
3Ø REM the hex dump code
4Ø REM Type in each line of 2Ø
5Ø REM hex digits as a single string
6Ø REM and then the checksum. E.g.
7Ø REM for the first line enter the
8Ø REM digits from F to 1
9Ø MEMORY 37985
1ØØ FOR n = 37986 TO 399Ø6 STEP 1Ø
11Ø LET t=Ø:PRINT n;":";
12Ø INPUT a$
13Ø FOR c = Ø TO 9
14Ø s = VAL("&"+MID$(a$,c*2+1,2)):POKE (c+n),s
15Ø t = t + s
16Ø NEXT
17Ø PRINT " = ";:INPUT ch
18Ø IF ch<> t THEN PRINT "input error
    - try again": GOTO 11Ø
19Ø NEXT
```



Hex dump.

37986	:F5D5C54DØ6Ø85C16ØØ21	= 893	38466	:D5CDEABBD1E13EFFAC67	= 1865	38946	:Ø3DD6EØ4CB85DD66Ø522	= 1036	39426	:3EC332ØEBC3EØ1322A9B	= 819
37996	:ØØØØCB393ØØ119CB23CB	= 775	38476	:3EFFAD6FC9FEØ1C22C9B	= 1450	38956	:7A95DD6EØ6DD66Ø7227B	= 1092	39436	:214A9B22D4BDC9DD66Ø2	= 1223
38006	:12Ø52ØF4C1D1F1C9F5D5	= 1601	38486	:DD7EØØ326D96FEØ12ØØ4	= 955	38966	:95C5D5ED5B78952A7A95	= 1469	39446	:DD6EØ4CD75BBCD6ØBBDD	= 1553
38016	:C5571EØØØ6ØØAFED5223	= 857	38496	:3EEA18Ø23EF6322C9632	= 924	38976	:CD8395D1C13A6D96FEØØ	= 1458	39456	:6EØØDD66Ø177C9Ø6ØØDD	= 989
38026	:F28F94192B291ØF4C1D1	= 1304	38506	:4496C9ØØCD1596ED5B76	= 1241	38986	:282721ØØØØCD5F982323	= 634	39466	:7EØØE6ØFC5Ø6Ø421589A	= 853
38036	:F1C9BF94C32E95C3AC95	= 1687	38516	:95ED4B74952A7695ED42	= 1338	38996	:7DB92ØF77CB82ØF3C3E8	= 1599	39476	:ØFCBBE3ØØ2CBFECBØE23	= 1167
38046	:C3ØB96C3D599C35196C3	= 1538	38526	:3ØØ2C5D17AFEØØ2Ø1Ø7B	= 1003	39006	:97C5D5E511ØØØØCDCØBB	= 1391	39486	:1ØF4C1DD23DD231ØE221	= 1240
38056	:F397C3Ø298C39F98C3B4	= 1624	38536	:FE3F3ØØB21ØØØØCD7E94	= 1016	39016	:E1D1D5E5CDF6BBE1D1C1	= 2141	39496	:589AØ6Ø4CBØ6231ØFBCD	= 968
38066	:98C3E599C3F699C3279A	= 1711	38546	:7DFEØØ2ØØ23EØ1FEØF38	= 801	39026	:C921ØØØØD5C511ØØØØCD	= 866	39506	:11BCCDC99AC955FFØØØØ	= 1306
38076	:C3139A434952434CC545	= 999	38556	:Ø23EØF32CØ96F52A7495	= 1023	39036	:CØBBE111ØØØØE5CDF6BB	= 1480	39516	:E5F5D5C53AØ39BFEØØ28	= 1394
38086	:4C4C495Ø53C5475Ø45CE	= 1011	38566	:232322C19621ØØØØ22C3	= 709	39046	:E1D1D5CDF6BBD121ØØØØ	= 1527	39526	:Ø678FEØØCA919AAFØ6Ø4	= 1066
38096	:475Ø415Ø45D246494CCC	= 998	38576	:96F132C596673AA795Ø4	= 1397	39056	:CDF6BB21ØØØØ11ØØØØCD	= 893	39536	:ED5B589A2A5A9ACBØ13Ø	= 1108
38106	:4D4153CB424FD8494E56	= 1026	38586	:32C696C3C796Ø222ØØ22	= 1012	39066	:F6BBC3E897FEØ1C22C9B	= 1659	39546	:ØBCBØ3CBØ2CBØ4CBØ5C3	= 1032
38116	:455253C55Ø41494ED453	= 1022	38596	:ØØ4Ø413AC59626ØØ6FED	= 920	39076	:DD7EØØE6Ø121B398BEC8	= 1332	39556	:B39AØ71ØEEØFED53589A	= 1171
38126	:544F46C653544FCE5354	= 1050	38606	:5B7495E5CDØ49B227895	= 1252	39086	:77CD9CBBC9ØØFEØ4D22C	= 1380	39566	:225A9AC147D1F1E1C368	= 1516
38136	:495Ø5Ø4CC5434F5Ø5943	= 888	38616	:EBE1D5ED5B7695CDØA9B	= 1638	39096	:9BFEØ32ØØ7CD7C95DD23	= 1185	39576	:ØCCB4428Ø2CBC7CB4228	= 1036
38146	:4841D2ØØØØØ795969401	= 802	38626	:227A95E53A7395FEØ128	= 1151	39106	:DD23DD6EØØDD66Ø1DD5E	= 1226	39586	:Ø2CBD7CB4528Ø2CBE7CB	= 1371
38156	:969421Ø795CDD1BC21FD	= 1375	38636	:1F2A7A95ED5BC3961313	= 1055	39116	:Ø2DD56Ø3ED537895227A	= 1057	39596	:4328D7CBF718D3CB4228	= 1316
38166	:9A2264BB3EC33263BBCD	= 1273	38646	:AFED523811192B2BD5ED	= 1128	39126	:95AF32D39932D4993253	= 1286	39606	:Ø2CBC7CB4328C9CBE718	= 1373
38176	:F6993EØ1CDØEBCCDB89B	= 1413	38656	:5B7895227A95CD2F96D1	= 1276	39136	:99325499325599326B99	= 1038	39616	:C5CB4328C1CBC718BDFE	= 1569
38186	:CDE599C9FEØ5D22C98FE	= 1710	38666	:18EA3A6D96FEØ12ØØ73A	= 927	39146	:326C99326D99CD11BCFE	= 1287	39626	:ØØ281ØFEØ1281821C19A	= 755
38196	:Ø42ØØ7CD7C95DD23DD23	= 1033	38676	:7395FEØØ2829ED5B7895	= 1196	39156	:Ø2282ØF53E233253993E	= 764	39636	:22849A216F9A36ØØC921	= 914
38206	:DD4EØØDD46Ø1ED431396	= 1064	38686	:2AC1962B2B3EØØBC381B	= 932	39166	:2B326B99F1FEØ1281Ø3E	= 967	39646	:999A22849A216F9A36Ø2	= 981
38216	:DD6EØ2DD66Ø3DD5EØ4DD	= 1199	38696	:AFED5238161913E5D52A	= 1100	39176	:233254993255993E2B32	= 765	39656	:C921B39A22849A216F9A	= 1185
38226	:56Ø5CD83953EØ2327395	= 954	38706	:7A953A7395FEØØ28Ø1EB	= 1123	39186	:6D99326C99CDE7BB325F	= 1341	39666	:36Ø4C9E5CDC99AE1CFCA	= 1682
38236	:ED437495ED4376953E3F	= 1265	38716	:CD2F96D1E118E5E1D122	= 1557	39196	:99327799326C9932A199	= 1182	39676	:8A32Ø39BCFA793ØØD511	= 1097
38246	:32A795ED537895227A95	= 1260	38726	:3A95ED5378953A6D96FE	= 1431	39206	:2A7A95ED5B7895CDB899	= 1452	39686	:ØØØØ19D1F5C5E5D5EB21	= 1514
38256	:C36E96Ø232ØØ32ØØ22ØØ	= 591	38736	:Ø12Ø4Ø3A7395FEØ12817	= 737	39216	:3AD4993C3C32D4996F26	= 1107	39696	:ØØ9C16ØØ197EE1CDD997	= 1127
38266	:23ØØDD7EØØCDDEBBC9C5	= 1394	38746	:2A7A95ED5BC39613ED52	= 1324	39226	:9D5E23562B244E2346ED	= 971	39706	:D1CB422Ø083EFFAD6F3E	= 1189
38276	:E5D5CDCCBBED53A89522	= 1709	38756	:38Ø819ED5B7895CD2F96	= 1091	39236	:537895ED437A952A7895	= 1238	39716	:FFAC67C1F1C9ØØØØØ611	= 1188
38286	:AA95D1E1D5E5ED4BAA95	= 1826	38766	:22C3963A7395FEØØ284A	= 1069	39246	:ED5B7A9523ØØØØØØEBD5	= 1082	39726	:21399B7ECD5ABB231ØF9	= 1153
38296	:Ø9EBED4BA895Ø9EBCDC9	= 1523	38776	:ED5B78952AC19613ED52	= 1320	39256	:E5CDFØBBE1D1FEØØCCB8	= 1937	39736	:C9ØA5Ø4152414D455445	= 802
38306	:BBE1D1C1C93FØØØØØØØØ	= 1078	38786	:383EED5B7A952A7895CD	= 1233	39266	:992A7895ED5B7A952ØØØ	= 1106	39746	:522Ø4552524F52ØAF53E	= 825
38316	:FEØ6D22C9BFEØ52ØØ7CD	= 1172	38796	:2F9622C196182F3A7395	= 967	39276	:ØØØØEBD5E5CDFØBBE1D1	= 1743	39756	:Ø132Ø39BE5CDCCBBED53	= 1354
38326	:7C95DD23DD23DD4EØØDD	= 1337	38806	:FEØ128112A7A95ED5B78	= 1073	39286	:FEØØCCB899ED5B78952A	= 1434	39766	:BØ9B22B29B11ØØØF21ØØ	= 748
38336	:66Ø1227695DD6EØ2DD66	= 1060	38816	:95CD2F9622C396ED53C1	= 1443	39296	:7A952323E5D5CDFØBBD1	= 1624	39776	:ØØCDC9BBCDC6BBED53B4	= 1683
38346	:Ø3227495221396DD6EØ4	= 840	38826	:963A7395FEØØ281Ø2A78	= 944	39306	:E1FEØØCCB899ED5B7895	= 1617	39786	:9B22B69BE15C16ØØ6229	= 1004
38356	:DD66Ø5DD5EØ6DD56Ø7CD	= 1168	38836	:95ED5B7A95CD2F9622C1	= 1377	39316	:2A7A952B2BE5D5CDFØBB	= 1403	39796	:292929EB292929CD11BC	= 891
38366	:8395ED537895227A953E	= 1236	38846	:9622C3963AC596673ACØ	= 1287	39326	:D1E1FEØØCCB8993AD499	= 1652	39806	:FEØ22ØØ629FEØ12ØØ129	= 680
38376	:7F32A795AF3273952A74	= 1140	38856	:9694673AC696BCDAE897	= 1500	39336	:21D3993C3CBBDC8CDØ9BB	= 1308	39816	:EBE5C1218FØ1ED42CDCØ	= 1534
38386	:95ED5B7695ED52D26E96	= 1533	38866	:7C32C596C3C796E567CD	= 1602	39346	:DADC99C33Ø99Ø5E5CDEA	= 1088	39826	:BBF1CDFCBB2AB69BED5B	= 1779
38396	:3C19327395EB227495ED	= 1170	38876	:62945C16ØØE16FCD6294	= 1147	39356	:BBC1D13AD3993C3C32D3	= 1392	39836	:B49BCDCØBB2AB29BED5B	= 1622
38406	:5376951863FEØ1C22C9B	= 1121	38886	:19C9ED5BA8952AAA95CD	= 1437	39366	:99269D6F7323722B2471	= 915	39846	:BØ9BCDC9BBAF32Ø39BC9	= 1508
38416	:C37C9532ØØ21ØØØØED5B	= 879	38896	:C9BBC9FEØ1C22C9BDD7E	= 1584	39376	:237ØC9ØØØØDD7EØØCDE4	= 1128	39856	:ØØØØØØØØØØØØØØØØØ635	= 59
38426	:1396E5D5CDEABBD1E13E	= 1733	38906	:ØØ322B9BCD59BCC9FEØ6	= 1191	39386	:BBC9FEØ3C23Ø99CD4BBB	= 1507	39866	:21C59B7E23CD5ABB1ØF9	= 1293
38436	:FFAA573EFFAB5FCDEABB	= 1721	38916	:D22C9BFEØ52ØØADD7EØØ	= 1057	39396	:C92168ØC22E9BDAF322A	= 1073	39876	:C9ØA2Ø5253582Ø455854	= 769
38446	:C9CD3296E5D5CDEABBD1	= 1883	38926	:CDDEBBDD23DD23DD4EØØ	= 1425	39406	:9B214A1322D4BDC9215C	= 1042	39886	:454E4445442Ø4752415Ø	= 682
38456	:E1E53EFFAA573EFFAB5F	= 1611	38936	:CB81DD46Ø1DD5EØ2DD56	= 1248	39416	:9A22E9BD21F59A22ØFBC	= 1279	39896	:4849435320524F555449	= 730
									39906	:4E4553ØAØAØD2Ø412E5Ø	= 486

S EXTENSIONS

same manner as circle.

|FILL,integer.| FILL,0 turns fill off. |FILL,1 turns fill on. FILL responds to the stipple command.

|GPAPER,graphics paper colour. The background graphics paper is set to the colour specified.

|GPEN,graphics pen colour. The foreground graphics pen is set to the colour specified.

|INVERSE,integer. |INVERSE,0 turns the inverse mode off and text is printed in the current pen colour on the current paper colour. |INVERSE,1 turns the inverse mode on and text is printed in current paper colour on the current pen colour.

Paint responds to stipple

|MASK,integer. Sets ink mask: |MASK,0 Force mode. Pixel plotted over background. |MASK,1 XOR mode. Pixel XORed with background pixel. |MASK,2 AND mode. Pixel ANDed with background pixel. |MASK,3 OR mode. Pixel ORed with background pixel.

|PAINT,x co-ordinate,y co-ordinate[,ink]. Paints an enclosed area of the graphics window around the point x,y. This command can be terminated by pressing Ctrl and C keys together. Paint responds to strippie, however the results are unpredictable.

|STIPPLE,pen 1,pen 2,pen 3,pen 4,pen 5,pen 6,pen 7,pen 8. Sets the order of pixel colour While stipple is activated the current graphics pen colour is ignored. Text will be printed in current stipple colours.

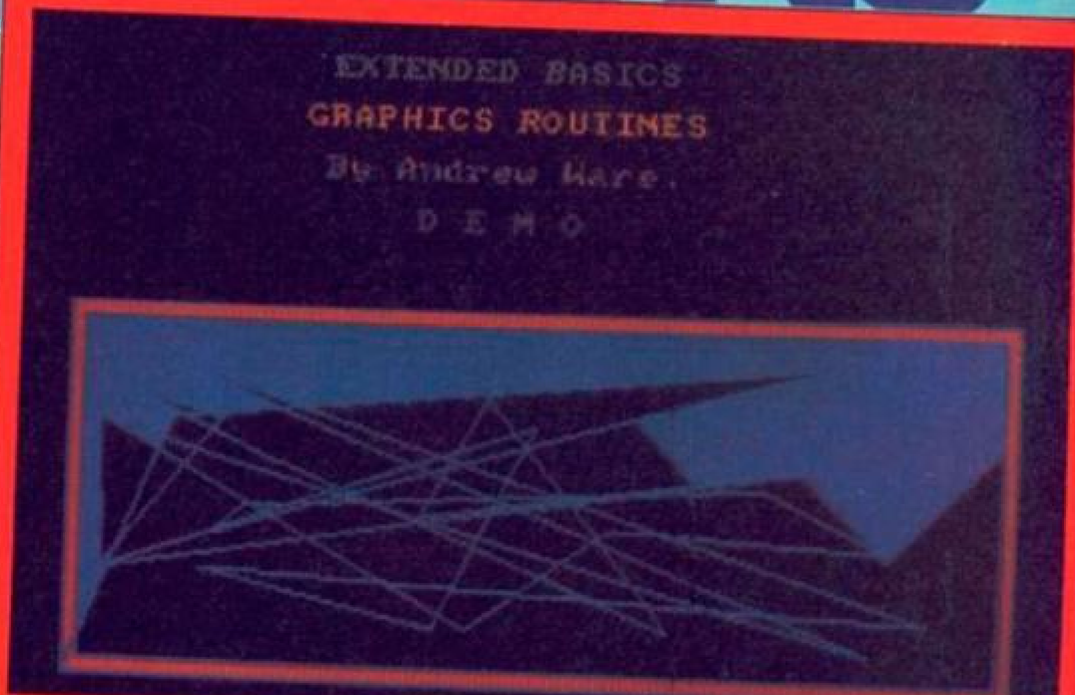
|STOFF. Turns stipple off.

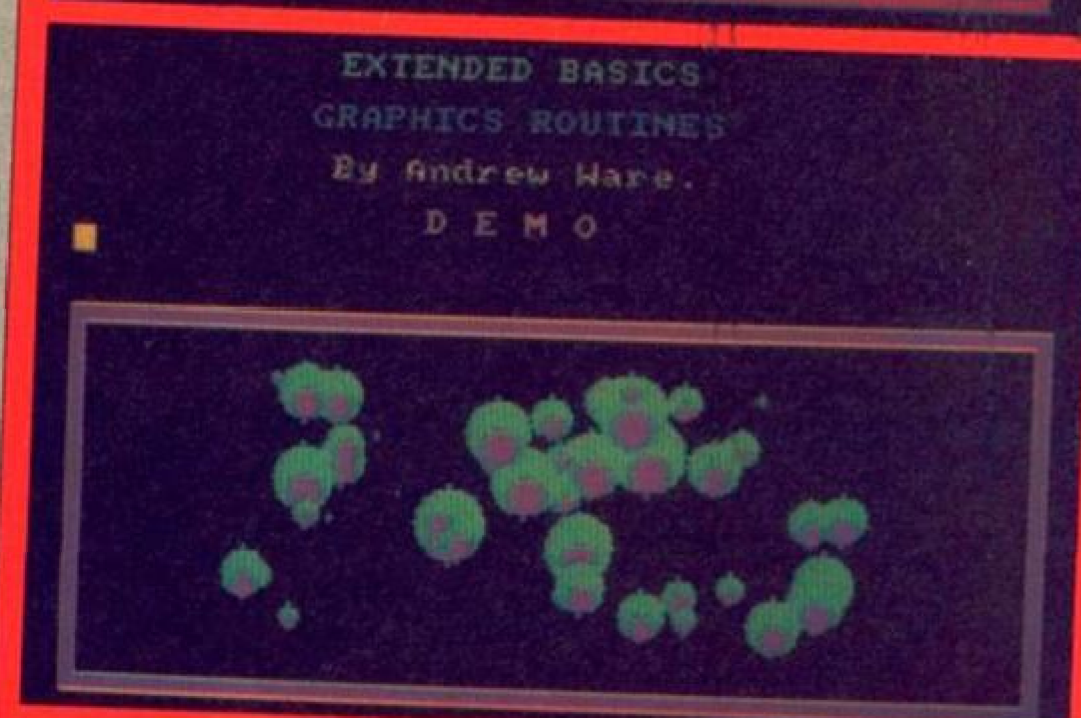
|STON. Turns stipple on.

Terms in brackets are optional and all co-ordinates are relative to the current graphics origin. ■

Program 2.

```
10 |MASK,0:INK 0,0:BORDER 0:INK 1,24:INK 2,6:INK 3,5:I
NK 4,15:INK 5,18:MODE 1:|STIPPLE,1,2,1,2,1,2,1,2:|STON
20 LOCATE 12,1:PRINT"EXTENDED BASICS":|STIPPLE,2,3,2,3
,2,3,2,3:LOCATE 11,3:PRINT"GRAPHICS ROUTINES":|STIPPLE
,1,2,3,1,1,2,3,1:LOCATE 12,5:PRINT"By Andrew Ware."
,1,2,3,1,1,2,3,1:LOCATE 16,7:PRINT"D E M O"
30 |STIPPLE,1,3,1,3,1,3,1,3:|BOX,10,10,619,219:|PAIN
:|STOFF
40 |FILL,0:|BOX,0,0,639,239,1:|BOX,10,10,619,219
r,5,5,3
50 |FILL,1:FOR f=0 TO 50:x=RND*400+120:y=RND*150+50:r=
RND*25:|CIRCLE,x,y,r,2:|CIRCLE,x,y-r/2,r/2,3:NEXT
60 FOR f=0 TO 20:INK 2,RND*26:INK 3,RND*26:FOR g=0 TO
500:NEXT:NEXT
70 INK 2,24:INK 3,6:INK 1,5:|FILL,1:FOR g=1 TO 3:|MASK
,f:FOR f=0 TO 4:|BOX,12,12,615,216,f:NEXT:NEXT
80 |MASK,0:|BOX,12,12,615,216,0
90 FOR f=0 TO 25:DRAW RND*600+20,RND*200+10,1:NEXT
100 FOR f=0 TO 20:x=RND*600+20:y=RND*200+10:IF TEST(x,
y)=0 THEN c=(f MOD 3)+1:|PAINT,x,y,c
110 NEXT
120 |MASK,0:MODE 1:|STON:|STIPPLE,1,2,1,2,1,2,1,2:PRIN
T" Rotating Planets ":|STIPPLE,1,1,1,1,1,1,1,2:FOR f=0
 TO 100:PLOT RND*640,RND*400,1:NEXT:|STOFF
130 |FILL,1::|CIRCLE,320,200,100,0:|ELLIPSE,320,0,320,
50:|FILL,0:FOR f=5 TO 100 STEP 10:|ELLIPSE,320,200,f,1
00,(f/10) MOD 3+1:NEXT
140 FOR f=5 TO 50 STEP 5:|ELLIPSE,320,0,320,f,(f/5)MOD
 3+1:NEXT
150 FOR f=0 TO 50
160 INK 1,6:INK 2,26:INK 3,24:GOSUB 190
170 INK 1,24:INK 2,6:INK 3,26:GOSUB 190
180 INK 1,26:INK 2,24:INK 3,6:GOSUB 190
185 NEXT:GOTO 200
190 FOR s=0 TO 100:NEXT:RETURN
200 CLS:|STON:PRINT"EXAMPLE OF STIPPLE"
210 FOR f=0 TO 3:FOR g=0 TO 3:FOR h=0 TO 3:FOR i=0 TO
3:|STIPPLE,f,g,h,i,f,g,h,i:PRINT "STIPPLE";
220 NEXT:NEXT:NEXT:NEXT
230 MODE 0:|STIPPLE,1,2,3,4,1,2,3,4:PRINT"In mode 0 up
 to 8    stipple colours can be defined."
240 |STIPPLE,1,3,5,7,9,11,13,15:PRINT"In mode 1 all fo
ur colours may be used to make up the eightparameters
of the    stipple command."
250 |STIPPLE,1,2,1,2,1,2,1,2:PRINT"In mode 2 both
 colours can be used to make up the eightcolours of th
e       stipple command."
260 FOR f=0 TO 10000:NEXT:INK 0,26:INK 1,5:BORDER 26:I
NK 2,6:INK 3,18:MODE 0:|STIPPLE,1,2,3,4,5,6,7,8:a$="|S
TIPPLE,1,2,3,4,5,6,7,8":PRINT a$:PRINT"In mode 0":FOR
f=0 TO 2000:NEXT
270 MODE 1:PRINT a$:PRINT"In mode 1":FOR f=0 TO 2000:N
EXT:MODE 2:PRINT a$:PRINT"In mode 2":FOR f= 0 TO 2000:
NEXT:RUN
```







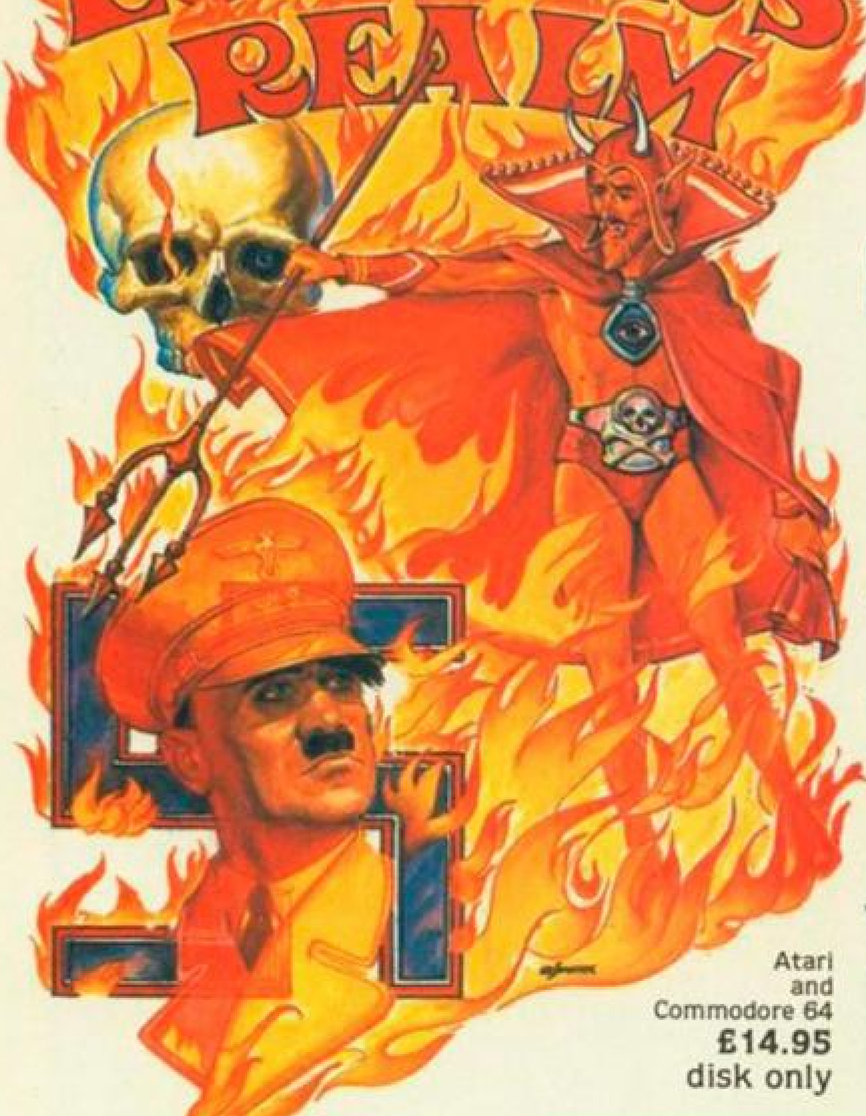
ATARI 64 128

TALES OF MYSTERY AND SUSPENSE...

AMERICAN EAGLE SOFTWARE, INC.

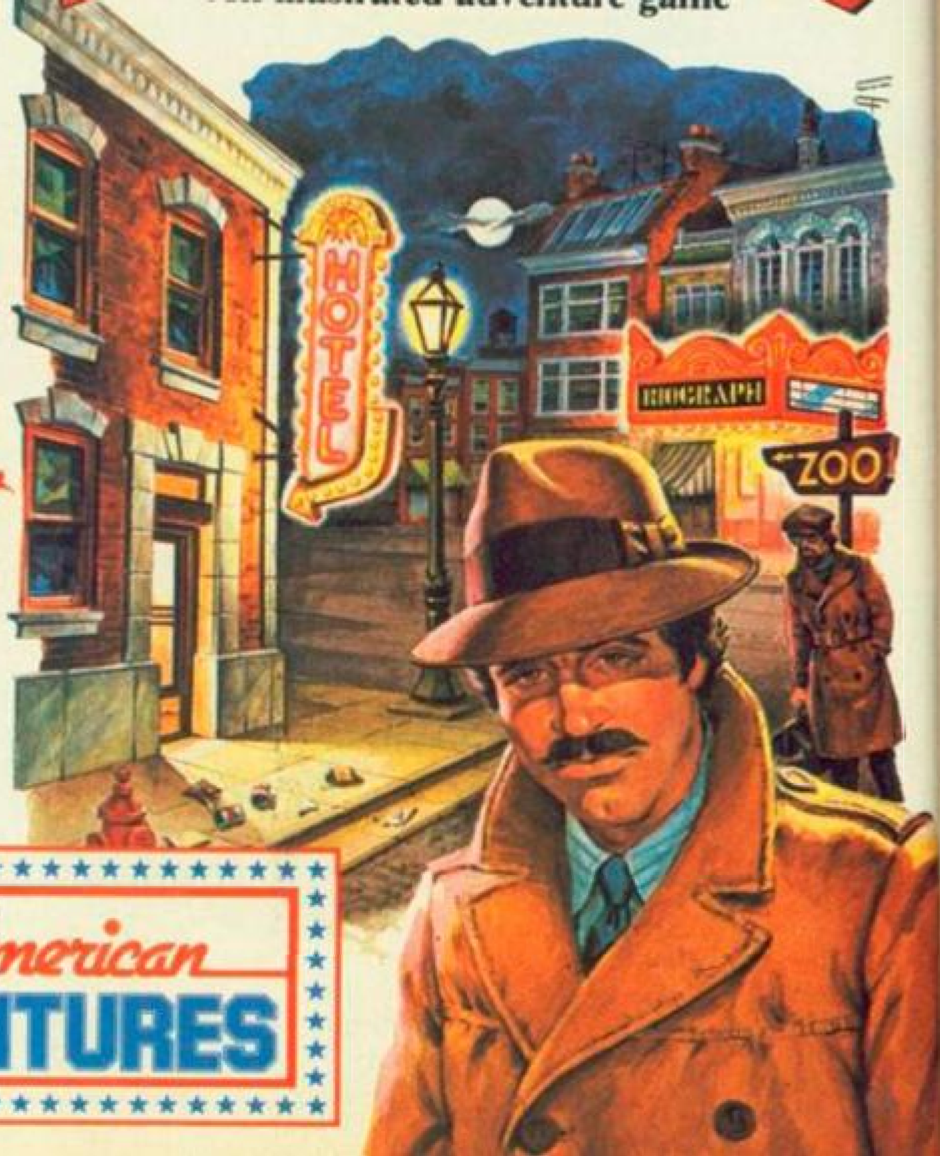
Test your powers of perception when you enter the exciting world of computer adventures. These games are designed to sharpen your mind rather than your reflexes. Not repetitive, or over in a flash; they will take more than a quick -fire finger to solve. Their only limit is that of your imagination . . . .

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CHANGER

WHEN LECTURING I often include informal definitions of computing terms to make them more memorable to students. My informal definition of a utility is a program which makes life easier for an operator or a programmer. The utility presented here falls into the latter category. This machine-code program does nothing that cannot be done from Basic; but it does it much faster and with much less bother to the programmer.

The utility is designed to manipulate the colour attributes of a BBC's mode 7 screen. A simple call is included to invert the colours — excluding black and white; a more involved series of calls will select an area of the screen to be affected, and allow a more precise exchange of attributes. All of this could be done from Basic; but would involve the program keeping track of the position and nature of teletext control codes. The memory involved for this may be greater than the memory occupied by this utility; and it would certainly execute more slowly.

Teletext — mode 7 — screens have colour and other attributes set and controlled by character codes in the range 129 to 159 Ascii. A control code on a line will control the manner in which succeeding characters on that line are presented by the hardware. Such codes only affect the current line up to either the end of the line or an overriding code on the same line.

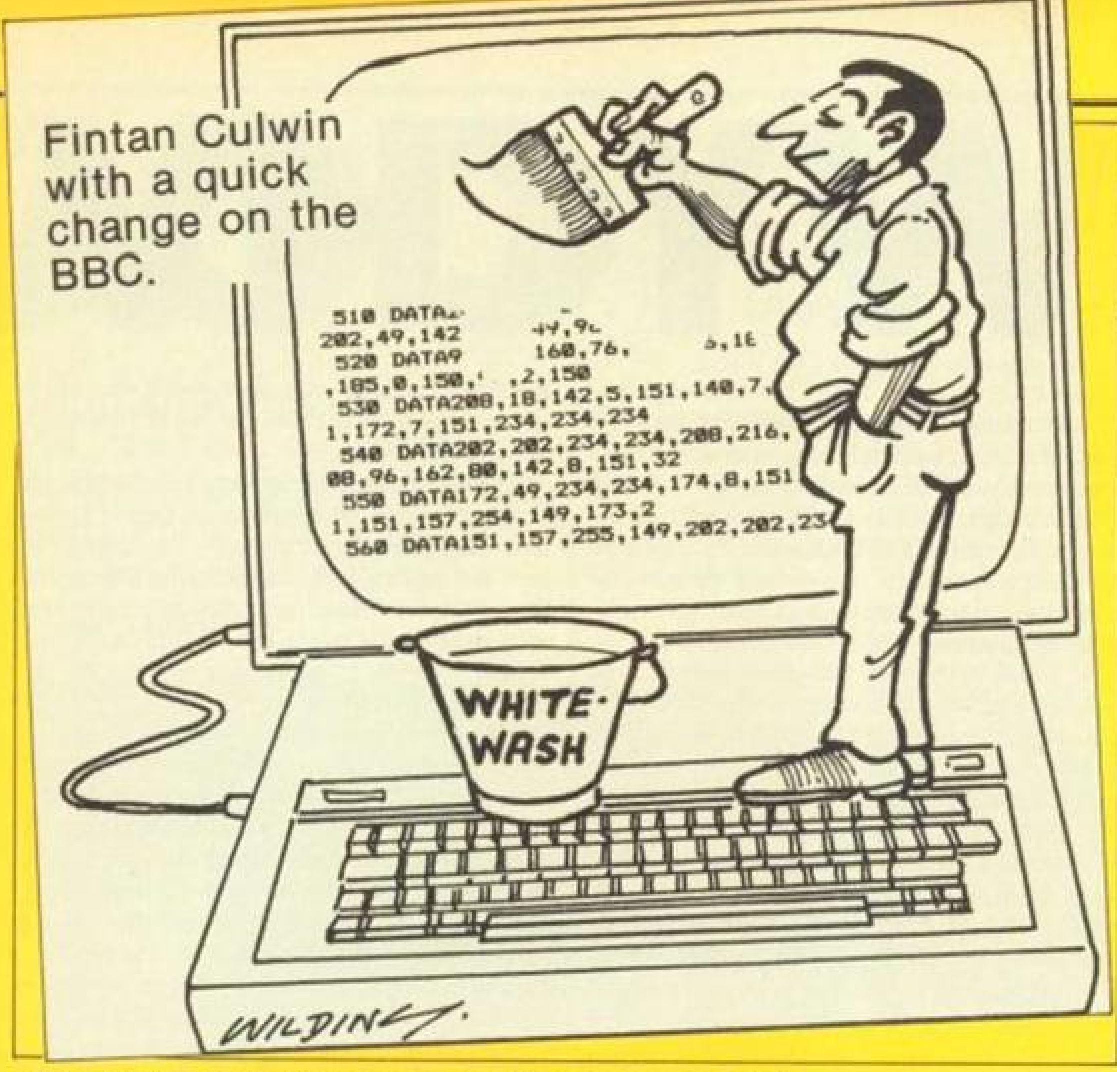
An example may make this clearer; suppose the message "HELLO!" is required to be presented in red text. The red text control code is given in the user guide as Ascii 129 (page 486). This can be incorporated into a string by the command

string$ = CHR$(129) + "HELLO!"

When this string is printed onto a mode 7 screen the control code will occupy one character position and the text will follow it in red. The colour will be changed by a following colour code or by the end of that line. If it is wanted to change the colour from red to blue; it is only necessary to change the control code from red text — 129 — to blue text — 132. It is not necessary to rewrite the text itself.

The utility presented here, if called without any parameters will cause a predefined change in text and graphic colour attributes. These predefined changes are red to green and vice versa, yellow to blue and cyan to magenta and vice versa. White codes are not affected.

```
100 MODE 7
110 REM MODE 7 CHANGER
120 REM FINTAN CULWIN
130 REM VERSION 1.0
140 origin% = &D02
150 FOR opt = 1 TO 3 STEP 2
155 P% = &D00
160 PROC prepare
170 PROC checkit
180 PROC doit
190 NEXT opt
200 PROC test
210 PROC_save
220 END
1000 DEF PROC prepare
1010 zerop = &70
1020 table = &72
1030 table70 = &85
1040 table71 = &C3   : REM address of *40 table
1100 [ OPT opt
1110 .yhi : NOP
1120 .ylo : NOP
1130 .xleft : NOP
1140 .xright : NOP
1150 .flag : NOP
1160 .address : NOP : NOP
1170 .temp : NOP : NOP
1180 .from : NOP
1190 .to   : NOP
1300]
1999 ENDPROC
2000 DEF PROC checkit
2010 [ OPT opt : .invert
2020 LDA &355
2030 CMP #7
2040 BNE wally
2050 LDA #0
2060STA flag
2070LDA &600
2080BEQ default
2082 CMP #2
2084 BEQ two
2090CMP #4
2100BEQ four
2110CMP #6
2120BEQ six
2130.wally   : BRK
2140]
2150?P% = &17
2160$(P%+1) = " wally !"
2170P%?9=0
2180P% = P% + 11   : REM ERROR MESASAGE
2200[ OPT opt
2210.default        \ default paramaters
2220 JSR setdefaults
2230 JMP main
2300.four           \ get four paramaters
2310JSR getfour
2320 JMP main
2400 .six           \ get six paramaters
2410 JSR getfour
2420 LDA &605
2430STA zerop
2440LDA &606
2450STA zerop+1
2460LDA (zerop),Y
2470 STA from
2480 LDA &610
2490 STA zerop
2500LDA &611
2510STA zerop+1
2520LDA (zerop),Y
2530STA to
2540INY
2550STY flag        \ set flag for change
2560 JMP main
2590.two            \ get two paramaters
2600JSR setdefaults
2610LDY #0
2620LDA &601
2630STA zerop
2640LDA &602
2650STA zerop+1
2660LDA (zerop),Y
2670STA from
2680LDA &604
2690STA zerop
2700LDA &605
2710STA zerop+1
2720LDA (zerop),Y
2730STA to
2735 INY
2738  STY  flag      \ set flag for change
2740JMP main
2800 .setdefaults   \ set default parameters
2810LDA #0
2820STA ylo
2830STA xleft
2840LDA #39
2850STA xright
2860LDA #24
2870STA yhi
2880RTS
2910 .getfour          \ STORE FIRST FOUR PARAMATERS
2920LDY #0
2930LDA &601
2940STA zerop
2950LDA &602
2960STA zerop+1
2970LDA (zerop),Y
2980STA xleft
2990LDA &604
3000STA zerop
3010LDA &605
3020STA zerop+1
3025 LDA (zerop),Y
3030STA xright
3040LDA &607
3050STA zerop
3060LDA &608
3070STA zerop+1
3075 LDA (zerop),Y
3080STA ylo
3090LDA &60A
3100STA zerop
3110LDA &60B
3120STA zerop+1
3125 LDA (zerop),Y
3130STA yhi
3140RTS
3150]
3160ENDPROC
4000 DEF PROC_doit
4010 [ OPT opt
4020 .main
4022 INC xright
4024  INC yhi         \ correct max values
4030.lineloop
4040LDA ylo
4050 ASL A          \ offset for table (2*Y)
4060TAY
4061 STY temp
4070LDA (table),Y
4080STA zerop+1
4090INY
4100LDA (table),Y
4110 STA zerop     \ offset from HIMEM
4112 CLC
4113 LDA #&7C
4115 ADC zerop+1
4116  STA zerop+1 \ add HIMEM to offset
4120JSR oneline
4130INC ylo
4140LDA ylo
4150CMP yhi
4160 BCC lineloop  \ do each line
4170 RTS             \ from routine
4200.oneline
4210 LDY xleft \ offset into Y index
4220  .nextchar LDA (zerop),Y \ get screen char into
4230 JSR onechar
4235  STA (zerop),Y  \ return to screen
4240 INY
4250 TYA
4260 CMP xright
4270  BCC nextchar     \ do each character
4290  RTS              \ from oneline
4500  .onechar
4510 LDX flag
4520  BNE switch       \ branch for change
4530 CMP #&81
4540  BCC nogud        \ byte too low
4550 CMP #&97
4560  BCS nogud        \ byte too high
4570  PHA              \ preserve byte
4580  AND #&0F         \ strip high nibble
4590  CMP #&7
4600  BCS notgud        \ low nibble > 7
4610 AND #1
4620  BNE up
4630 PLA : TAX           \ increase byte
4635 DEX
4640  TXA
4650  RTS                \ decrease byte
4660 .up                 \ from onchar down
4670 PLA : TAX
4675 INX
4680  TXA
4690  RTS                \ increase byte
4700  .notgud PLA        \ from onechar up
4710  .nogud RTS                 \ from onechar no good
4800  .switch
4810 CMP from
4820  BNE nogud                  \ not to be switched
4830  LDA to                     \ change it !
4840  RTS                        \ from onechar switch
4850 ]
4999 ENDPROC
6000 DEF PROC test
6010 CLS
6020 screen$ = CHR$(133)+CHR$(157)+CHR$(147)+CHR$(234)+CHR$(131)+STRING$(32," ")+CHR$(147)+CHR$(181)+CHR$(32)
6030 FOR ytab= 0 TO 21
6040 PRINT screen$;
6050 NEXT
6060 PRINTTAB(3,0)CHR$(232)+STRING$(34,CHR$(252))+CHR$(180)
6070 PRINTTAB(3,21)CHR$(170)+STRING$(34,CHR$(175))+CHR$(165)
6080 FOR char = 0 TO 6
6090 PRINTTAB(15,3*char);CHR$(156);CHR$(129+char);"TESTING "+CHR$(133)+CHR$(157);
6099 PRINTTAB(0,15);
6100 NEXTchar
6110 star$=CHR$(157)+CHR$(132)+"********"+CHR$(129)+"==============="+CHR$(133)+CHR$(157)
6120 stripe$=CHR$(157)+CHR$(132)+"======================="+CHR$(133)+CHR$(157)
6130 FOR star = 11 TO 14 :PRINTTAB(7,star)star$ : NEXT star
6140 FOR stripe = 15 TO 19 :PRINTTAB(7,stripe)stripe$:NEXTstripe
6150 FOR demo = 1 TO 6
6160 PROC_message("INVERT WHOLE SCREEN")
6170 CALL invert
6180 NEXT demo
6190 left% = 0 : right% = 39 : top% = 0
6200 FOR demo% = 1 TO 21
6210 PROC_message("INVERT PART SCREEN")
6220 CALL invert,left%,right%,top%,demo%
6230 NEXT demo%
6240 PROC_message("CHANGE CYAN TO MAGENTA")
6250 cyan% = 134 : magenta% = 133
6260 CALL invert,cyan%,magenta%
6270 PROC_message("CHANGE STARS TO STRIPES")
6280 star% = 42 : stripe% = 61 : string% = 36
6300 PROC_message("FIRST STARS TO STRING")
6310 CALL invert,star%,string%
6320 PROC message("NOW STRIPE TO STAR")
6330 CALL invert,stripe%,star%
6340 PROC message("AND STRING TO STRIPE")
6350 CALL invert,string%,stripe%
6360 left% = 7 : right% = 36: top% =11
6370 PROC message("ONE LINE AT A TIME...")
6380 FOR bottom% = 11 TO 19
6385 top% = bottom%
6390 CALL invert,left%,right%,top%,bottom%,star%,string%
6400 CALL invert,left%,right%,top%,bottom%,stripe%,star%
6410 CALL invert,left%,right%,top%,bottom%,string%,stripe%
6420 TIME=0 : REPEAT UNTIL TIME > 50
6430 NEXT bottom%
6440 PROC_message("THAT'S ALL FOLKS")
6450 ENDPROC
6900 DEF PROC message(string$)
6905 *FX 15,0
6908 VDU28,0,24,39,22,12,26
6910 xtab= (40 - LEN(string$))/2
6920 FOR ytab = 22 TO 23
6930 PRINTTAB(xtab,ytab)CHR$(141);string$
6940 NEXT ytab
6950 PRINTTAB(14) "PRESS";CHR$(136);"SPACE";CHR$(137);"BAR";
6960 REM TIME = 0 : REPEAT UNTIL TIME > 100
6970 REPEAT
6980 UNTIL INKEY(-99)
6990 ENDPROC
6999 ENDPROC
7000 DEF PROC_save
7005 VDU7
7010 VDU28,4,19,36,2,12,26
7100 PRINTTAB(8,0);
7110 PRINTTAB(11,24)STRING$(15," ");
7120 yellow% = 131 : blue% = 132 : green% = 130
7130 CALL invert,yellow%,green%
7140 CALL invert,blue%,green%
7150 PRINTTAB(10,5)CHR$(129)"CODE ASSEMBLED "
7160 PRINTTAB(5,7)CHR$(129)"START  ADDRESS ""origin%
7170 PRINTTAB(5,9)CHR$(129)"END    ADDRESS ""P%
7180 PRINTTAB(5,11)CHR$(129)"ACTION ADDRESS ""main
7190 PRINTTAB(5,24);
7200 ENDPROC
```





The default of the whole screen can be modified by adding four integer parameters to the call. These parameters define an area of the screen in the order leftX, rightX, topY and bottomY. Only the codes in this area will be changed; but the effects of the codes may extend to the right of the area.

More selective control of the changes can be made by specifying two or six integer parameters. Two parameters indicate a code to be found and a code to replace it. These codes are not limited to teletext control codes; any Ascii characters can be exchanged. Two integer parameters will effect the whole screen; six will select an area of the screen. The first four define the area as before; the last two specify the codes to be found and replaced respectively.

Only a limited error checking is provided. A check is made that the machine is in mode 7; and a check is made that the correct nns only. The left/right and up/down should be in the correct order and within the confines of the screen. If these conditions are not adhered to unexpected and possibly disastrous results will be obtained.

For the non technical all that is necessary is to copy out the listing. It is configured for tape based systems to occupy memory from &D00 onwards; it extends beyond the normal start of user memory &E00; so it will have to be protected or assembled for a different area. When run the code is first assembled and then tested with all four possible types of command. Once tested the start, end and execution addresses are displayed allowing a working copy to be saved. ■

WYCHW

SOME PEOPLE make a fetish out of "good" programming. Computer academics run riot with the idea that any Goto instruction in a program should be erased as though it were a manifestation of the Devil himself. Other people have more laid back attitudes which do not necessarily help to produce tight, error proof, well documented programs that can be used by someone other than the author.

As usual, a sensible mid-point between the poles of opposing arguments seems to produce a good outcome; there are solid advantages in structuring a program so that the logic of the steps that the computer needs to follow is set out clearly and simply; while an occasional Goto, with a local destination and not crossing any exits from the segment of the program in which it is used, produces no confusion and can save space and effort.

I tend to write programs out of my head and the tidying up gets done later on when I have some idea that I can achieve what I want to do. That's the opposite of what you might be taught about "proper" computing but it's human and the end result may not be so bad. What you do need is a sense of the good structure at which you are aiming finally.

Figure 1 is a listing of Wychwood; a plotter control language for the BBC micro. I wrote the program originally because I wanted to control the sophisticated features of an Epson HI-80 plotter and that's quite difficult to do using Basic, spreadsheet programs or a word processor. The version listed here is adapted for the Oric-1/Tandy four colour plotter.

All computer langauges allow you to construct a series of steps, or program instructions, that the computer will follow when the program is run. If you are writing a language in Basic you need some way of inputting and storing the steps that the computer is to carry out.

It would be possible to enter each step at the keyboard, store the sequence on tape or floppy disc and then run the program by starting the tape and reading each instruction as it occurred. One obvious difficulty of this method is that all programming languages provide facilities to repeat a series of operations until a desired result is achieved.

With the program steps stored on tape you'll have to rewind the tape each time the program went round the loop. That seems a bit slow and perhaps boring — but it could be done.

Another method of holding the instructions that your langauge must follow is to place the program steps into a Basic array. Finding the start of the program is easy, to find the next instruction you need only increment a counter by one, and loops are easy to establish and run as you can alter the value of the counter to point to the instruction after the label that marks the start of the loop.

For example, Wychwood uses the array A$ to hold the series of instructions that form a Wychwood program.

The idea of using an array to store the instructions that are to be carried out by Wychwood is fine so far as it goes. But first of all the program you have written to control a plotter will be lost when the power to the computer is turned off, and second, the BBC computer is comparatively short of space for very large arrays.

In fact, the second objection is a good thing because it leads to a neat solution which removes all practical limitations on the size of plotter control program you can wirte and gives

Figure 1.

```
10 REM  WYCHWOOD  Plotter control program for the ORIC-1
20
30 GOTO 70
40 GOTO 3810: REM Indirection to program error routine
50 GOTO 3920: REM Indirection to PROCPLOT error routine
60
70 Drive$ = "1": F$ = "Default"
80 *FX4,1
90 MODE 3
100 CLOSE#0
110 ARRAYSIZE = 150
120 DIM A$(ARRAYSIZE)
130 CLS
140 PRINT SPC(15); "WYCHWOOD - Plotter Control Program"
150 PRINT: PRINT SPC(15); "(c) John Dawson 1985"
160 PRINT: PRINT SPC(15); "Version 1.10"
170 PRINT: PRINT SPC(15); "for the ORIC-1 plotter"
180 FOR delay% = 0 TO 700: NEXT delay%
190 CLS
200
210 REPEAT
220   ON ERROR GOTO 40
230   *DRIVE 0
240   PROCINSTRUCTS("COMMAND")
250   Z$ = GET$
260   IF Z$ = "W" THEN E% = 0: PROCWRITE
270   IF Z$ = "E" THEN PROCEDIT_PLOT
280   IF Z$ = "S" THEN PROCSAVE
290   IF Z$ = "R" THEN PROCLOAD
300   IF Z$ = "D" THEN PROCCHANGE_DRIVE
310   IF Z$ = "P" THEN PROCSTART_UP: PROCPLOT: VDU3
320   IF Z$ = "L" THEN PROCLIST_PLOT
330   IF Z$ = "C" THEN PROCCATALOGUE
340   IF Z$ = "T" THEN PROCSPOOL_TEXT
350   UNTIL Z$ = "X"
360 VDU26
370 VDU12
380 END
390
400 DEF PROCCATALOGUE
410 PROCRH_WINDOW
420 CLS
430 PRINT "CATALOGUE of the current data disc"
440 PRINT STRING$(48,"_")
450 PRINT: PRINT
460 IF Drive$ = "0" THEN *.0
470 IF Drive$ = "1" THEN *.1
480 IF Drive$ = "2" THEN *.2
490 IF Drive$ = "3" THEN *.3
500 PRINT
510 ENDPROC
520
530 DEF PROCCHANGE_DRIVE
540 PROCRH_WINDOW
550 CLS
560 PRINT "DATA - alter the drive number for data storage"
570 PRINT STRING$(48,"_")
580 PRINT TAB(0,5); "Current drive number is "; Drive$
590 PRINT TAB(0,7); "ENTER new drive number or"
600 PRINT "press (Return) to leave unchanged ";
610 Z$ = GET$
620 IF Z$ = CHR$(13) THEN 660
630 IF Z$ = "0" THEN Drive$ = Z$:GOTO 660
640 IF VAL(Z$) < 1 OR VAL(Z$) > 3 THEN VDU7: GOTO 590
650 Drive$ = Z$
660 CLS
670 ENDPROC
680
690 DEF PROCERASE_LINE(Y)
700 VDU 31,0,Y
710 PRINT SPC(79)
720 ENDPROC
730
740 DEF PROCRETURN
750 PRINT "Press (Return) to continue ";
760 x$ = GET$: IF x$ <> CHR$(13) THEN 760
770 ENDPROC
780
790 DEF PROCSTART_UP
800 PROCRH_WINDOW
810 CLS
820 PRINT "PLOT current array"
830 PRINT STRING$(48,"_")
840 PROCRH_W2
850 *FX5,1
860 *FX6,10
870 VDU 2
880 VDU 1,13,1,18,1,17
890 PRINT "I"
900 ENDPROC
910
920 DEF PROCLH_WINDOW
930 VDU 28,0,24,30,0
940 ENDPROC
950
960 DEF PROCRH_W2
970 VDU 28,31,24,79,3
980 ENDPROC
990
1000 DEF PROCRH_WINDOW
1010 VDU 28,31,24,79,0
1020 ENDPROC
1030
1040 DEF PROCWRITE
1050 PROCINSTRUCTS("ELEMENT")
1060 PROCRH_WINDOW
1070 CLS
1080 C%=0%
1090 REPEAT
1100   PRINT STR$(C%); ":";
1110   INPUT LINE " " Z$
1120   IF Z$ = "Q" THEN 1150
1130   A$(C%) = Z$
1140   C% = C%+1
1150   UNTIL C% >= ARRAYSIZE OR Z$ = "Q"
1160 C% = C%-1
1170 ENDPROC
1180
1190 DEF PROCINSTRUCTS(x$)
1200 PROCLH_WINDOW
1210 CLS
1220 Y = OPENUP x$
1230 REPEAT
1240   INPUT£Y,Y$
1250   PRINT Y$;
1260   IF NOT EOF£Y THEN PRINT
1270   UNTIL EOF£Y
1280 CLOSE£Y
1290 ENDPROC
1300
1310 DEF PROCPLOT
1320 ON ERROR GOTO 50
1330 CLS: Err1$ = F$
1340 FOR D% = 0 TO C%
1350   Err% = D%: Err$ = Err1$
1360   IF LEFT$(A$(D%),1) = ":" THEN NEXT D%
1370 IF LEFT$(A$(D%),1) = "." THEN PROCMACRO ELSE
PRINT A$(D%)
1380 NEXT D%
1390 VDU26
1400 CLS
1410 ENDPROC
1420
1430 DEF PROCSAVE
1440 CLOSE#0
1450 PROCRH_WINDOW
1460 CLS
1470 PRINT "SAVE plot array to disc"
1480 PRINT STRING$(48,"_")
1490 PRINT TAB(0,3) "CHECK data disc is in drive "; Drive$
1500 PRINT TAB(0,5) "ENTER file name";
1510 INPUT " " N$
1520 IF LEN(N$) > 7 THEN VDU7: GOTO 1500
1530 F$ = ":"+Drive$+".X."+N$
1540 Y = OPENOUT(F$)
1550 PRINT£Y,N$,C%
1560 FOR D%=0 TO C%
1570   PRINT£Y,A$(D%)
1580   NEXT D%
1590 CLOSE£Y
1600 CLS
1610 ENDPROC
1620
```

```
1630 DEF PROCLOAD
1640 CLOSE#0
1650 PROCRH_WINDOW
1660 CLS
1670 PRINT "READ plot array from disc"
1680 PRINT STRING$(48,"_")
1690 PRINT TAB(0,3) "CHECK data disc is in drive ";Drive$
1700 PRINT TAB(0,6) "ENTER file name";
1710 INPUT " " N$
1720 IF N$ = "" THEN PROCCATALOGUE: PROCRETURN: GOTO 1660
1730 IF LEN(N$) > 7 THEN VDU7: GOTO 1700
1740 F$ = ":"+Drive$+".X."+N$
1750 FOR F% = 0 TO C%+1: A$(F%) = "": NEXT F%
1760 Y = OPENUP(F$)
1770 INPUT£Y,N$,C%
1780 PROCRH_WINDOW
1790 CLS
1800 PRINT "Loading ";F$
1810 C%=0
1820 REPEAT
1830   INPUT£Y,A$(C%)
1840   PRINT A$(C%)
1850   C%=C%+1
1860   UNTIL EOF£Y
1870 CLOSE£Y
1880 C% = C%-1
1890 CLS
1900 ENDPROC
1910
1920 DEF PROCMACRO
1930 K = INSTR(".AXIS-1.GREEN.RED.BLUE.BLACK.TITLE.SIZE0.
SIZE4",A$(D%))
1940 IF K = 0 THEN 2050
1950 IF K = 1 THEN RESTORE 4050: PROCCX
1960 IF K = 8 THEN PRINT "C2"
1970 IF K = 14 THEN PRINT "C3"
1980 IF K = 18 THEN PRINT "C2"
1990 IF K = 23 THEN PRINT "C0"
2000 IF K = 29 THEN RESTORE 4060: PROCCX
2010 IF K = 35 THEN PRINT "S0"
2020 IF K = 42 THEN PRINT "S1"
2030 ENDPROC
```

Figure 2.

```
WRITE      a new plot sequence
EDIT   the current plot array
STORE  the plot array to disc
READ   a plot array from disc

PLOT          the current array
LIST   the current plot array

CATALOGUE    the current disc
DRIVE    alter the data drive

TEXT spool array to text file

EXIT <X> to BASIC
Which C D E L P R S T W X
```

```
WYCHWOOD - Plot array editor
----------------------------

APPEND instructions to array

DELETE instruction

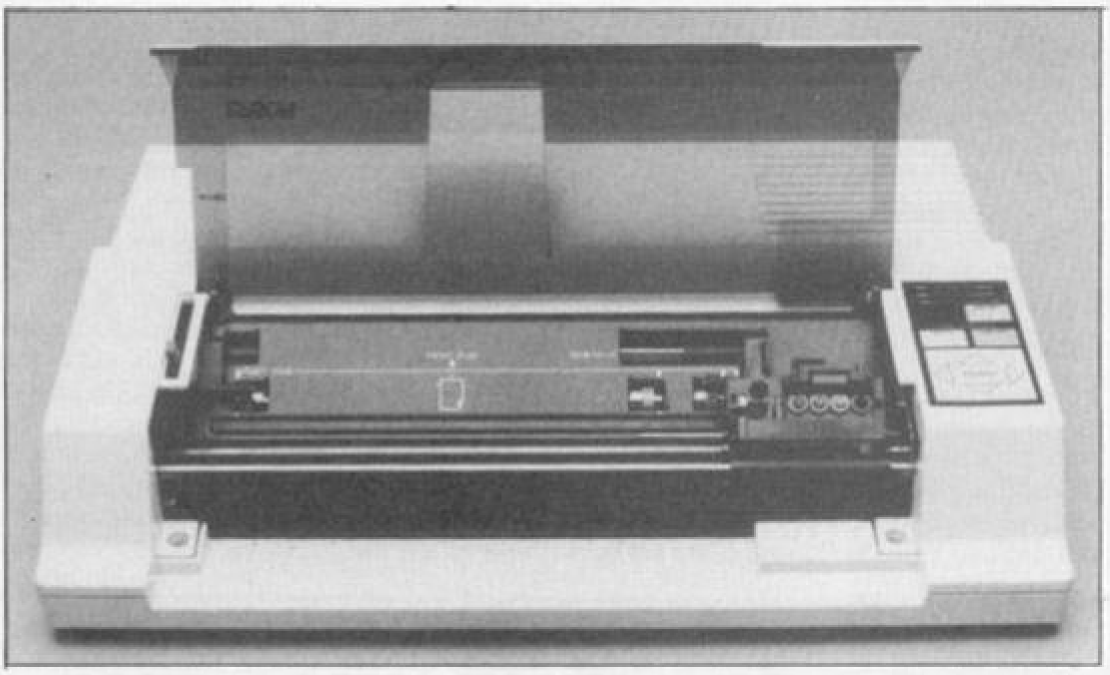
INSERT instructions into the
       array.  Enter <Q> to
       exit the insert mode

MODIFY an instruction

EXIT <X> the editor to
       return to the MCL
```

OOD

John Dawson with Wychwood, a plotter control language for the BBC micro to control the features of the Oric-1/Tandy.



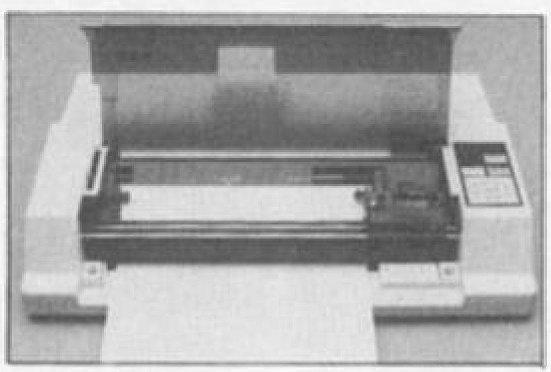
your programs a tidy, easy to understand structure. The solution does depend, however, on the use of a floppy disc drive.

In theory, you could use the program with one or two cassette decks but you lose the ability to find one out of a collection of files in a few milliseconds and that will make the program very frustrating to use.

Before you can "run" a Wychwood program, you need to be able to enter the instructions into the program array, save the program on a floppy disc and read it back into the computer. Nobody writes correct programs in one go and Wychwood has an editing facility that allows you to Modify, Delete, Insert and Append instructions to those already in the array. The functions available from the Main Command Level (lines 210-350) are:

- W Write a new program
- E Edit the contents of the A$ program array
- S Store the A$ array on disc
- R Read a program from disc into the A$ array
- D Change the current data disc — default '1'
- P Send the contents of A$ to the plotter
- L List the A$ program array to a parallel printer
- C Display a catalogue of the current data disc
- T Produce a text file from the current A$ array
- X Exit the Wychwood program to Basic

For my own education, I decided that I wanted to show different prompt messages and instructions on screen at various places in the program. It is inefficient to try to store these as part of the Basic program because the relatively large amounts of textual information seriously detracted from the data you can hold



in the machine at any one time.

This is a key difference between a program written for the BBC using cassette tape as its mass storage facility and the same machine fitted with disc drives. A cassette tape based program must hold the whole program in Ram at once unless you intend to Chain one section of the program after another. With floppy discs you can ready one file or another from disc just as often as you want.

(continued on next page)

```
2040
2050 X = INSTR(",INCX,INCY,SETX,SETY,LOOP", LEFT$(A$(D%),5))
2060 IF X = 0 THEN 2170
2065 V% = LEN(A$(D%))-5
2070 XY$ = RIGHT$(A$(D%),V%)
2080 XYZ = VAL(XY$)
2090 IF X = 1 THEN X1 = X1+XYZ
2100 IF X = 6 THEN Y1 = Y1+XYZ
2120 IF X = 11 THEN X1 = XYZ
2130 IF X = 16 THEN Y1 = XYZ
2140 IF X = 21 THEN Loop% = XYZ
2150 ENDPROC
2160
2170 X = INSTR(",REPEAT,UNTIL", A$(D%))
2180 IF X = 0 THEN PROC_ELEMENT
2190 IF X = 1 THEN Repeat% = D%
2200 IF X = 8 THEN PROC_UNTIL
2210 ENDPROC
2220
2230 DEF PROCEDIT_PLOT
2240 PROCINSTRUCTS("EDITOR")
2250 POS = 15
2260 PSTART% = 0
2270
2280 REPEAT
2290   PROCDISPLAY_PAGE
2300   PROCEDIT_COMMAND
2310   IF Z% = 138 THEN PSTART% = PSTART%+10: D% = D%+10
2320   IF Z% = 139 THEN PSTART% = PSTART%-10: D% = D%-10
2330   IF PSTART% >= ARRAYSIZE THEN PSTART% = ARRAYSIZE-15: D% = PSTART%
2340   IF PSTART% < 0 THEN PSTART% = 0: D% = PSTART%
2350   IF Z$ = "A" THEN D% = C%+1: PROCWRITE: PROCINSTRUCTS("EDITOR")
2360   IF Z$ = "D" THEN PROCDELETE
2370   IF Z$ = "I" THEN PROCINSERT
2380   IF Z$ = "M" THEN PROCMODIFY
2390   UNTIL Z$ = "X" OR Z$ = "x"
2400 Z$ = ""
2410 PROCRH_WINDOW
2420 CLS
2430 ENDPROC
2440
2450
2460 DEF PROCDISPLAY_PAGE
2470 PROCRH_WINDOW
2480 CLS
2490 FOR H% = PSTART% TO PSTART%+POS
2500   PRINT STR$(H%);": ";A$(H%)
2510   NEXT H%
2520 ENDPROC
2530
2540 DEF PROCEDIT_COMMAND
2550 *FX4,1
2560 VDU28,31,24,79,19
2570 CLS
2580 PRINT STRING$(48,"_")
2590 PRINT "Select (A D I M X) ";
2600 IF D% < PSTART% THEN D% = PSTART%
2610 IF D% >= PSTART%+POS THEN D% = PSTART%+POS
2620 PRINT TAB(0,3); SPC(48)
2630 PRINT TAB(0,3); STR$(D%); ": ";A$(D%)
2640 PRINT TAB(3,4);
2650 Z% = GET
2660 IF Z% = 136 THEN D% = D%-1: GOTO 2600
2670 IF Z% = 137 THEN D% = D%+1: GOTO 2600
2680 Z$ = CHR$(Z%)
2690 *FX4,0
2700 ENDPROC
2710
2720 DEF PROCDELETE
2730 FOR E% = D% TO ARRAYSIZE-1
2740   A$(E%) = A$(E%+1)
2750   NEXT E%
2760 A$(ARRAYSIZE) = ""
2770 C% = C%-1
2780 ENDPROC
2790
2800 DEF PROCINSERT
2810 FOR E% = ARRAYSIZE TO D% STEP -1
2820   IF E% < 1 THEN 2840
2830   A$(E%) = A$(E%-1)
2840   NEXT E%
2850 C% = C%+1
2860 A$(D%) = ""
2870 CLS
2880 PRINT STRING$(48,"_")
2890 PRINT "ENTER new instruction"
2900 IF D% < 1 THEN 2920
2910 PRINT TAB(0,2); STR$(D%-1); ": "; A$(D%-1)
2920 PRINT TAB(0,4); STR$(D%+1); ": "; A$(D%+1)
2930 PRINT TAB(0,3); STR$(D%);:INPUT LINE ": " A$(D%)
2940 IF A$(D%) = "D" OR A$(D%) = "d" THEN PROCDELETE:
ENDPROC
2950 D% = D%+1
2960 GOTO 2810
2970
2980 DEF PROCMODIFY
2990 CLS
3000 PRINT STRING$(48,"_")
3010 PRINT "COPY or MODIFY the current instruction"
3020 PRINT TAB(0,3); STR$(D%); ": "; A$(D%)
3030 PRINT TAB(0,4); STR$(D%); ": ";
3040 INPUT LINE "" E$
3050 IF E$ = "" THEN ENDPROC ELSE A$(D%) = E$
3060 ENDPROC
3070
3080 DEF PROCLIST_PLOT
3090 PROCRH_WINDOW
3100 CLS
3110 IF A$(0) = "" THEN 3390
3120 PRINT TAB(0,6) "Enter page header (40 chars max)
****; ";
3130 INPUT LINE "" TI$
3140 IF LEN(TI$) > 40 THEN VDU7: GOTO 3100
3150 *FX5,1
3160 *FX6,0
3170 VDU 2
3180 PL% = 50: PP% = 1
3190 FOR E% = 0 TO C% STEP PL%
3200   PRINT SPC(10); TI$;
3210   PRINT TAB(60); "Page "; PP%
3220   PRINT: PRINT
3230   FOR J% = 0 TO PL%-1
3240     PRINT SPC(10); STR$(E%+J%);
3250     PRINT TAB(16); A$(E%+J%)
3260     IF A$(E%+J%) = "" THEN 3370
3270     NEXT J%
3280   VDU 1,12
3290   VDU 3
3300   CLS
3310   PP% = PP%+1
3320   PRINT TAB(0,6) "Press <RETURN> to continue"
3330   Y$ = GET$: IF Y$ <> CHR$(13) THEN 3330
3340   CLS
3350   VDU 2
3360   NEXT E%
3370 VDU 3
3380 GOTO 3420
3390 CLS
3400 VDU7: PRINT "PLOT ARRAY EMPTY ";
3410 FOR DELAY% = 0 TO 1000: NEXT DELAY%
3420 PROCLH_WINDOW
3430 ENDPROC
3440
3450 DEF PROCSPOOL_TEXT
3460 *DELETE T.DEFAULT
3470 PROCRH_WINDOW
3480 *SPOOL T.DEFAULT
3490 PROCPLOT
3500 *SPOOL
3510 ENDPROC
3520
3530 DEF PROC_ELEMENT
3540 CLOSE#0
3550 F$ = ":"+Drive$+".T"+A$(D%)
3560 E = OPENUP(F$): Err$ = F$: Err% = 0
3570 REPEAT
3580   Char% = BGET#E
3590   Char$ = CHR$(Char%)
3600   PRINT Char$;
3610   Err% = Err%+1
3620   UNTIL EOF#E
3630 CLOSE# E
3640 ENDPROC
3650
3660 DEF PROCCX
3670 READ J%
3680 FOR H% = 1 TO J%
3690   READ COMM$
3700   PRINT COMM$
3710   NEXT H%
3720 ENDPROC
3730
3740 DEF PROC_UNTIL
3750 Loop% = Loop%-1
3770 IF Loop% > 0 THEN D% = Repeat% ELSE ENDPROC
3780 ENDPROC
3790
3800 VDU 3
3810 VDU 26
3820 VDU 12
3830 PRINT TAB(10,1) "PROGRAM FAULT ": VDU 7
3840 PRINT TAB(10,4) "Fault in line number "; ERL
3850 PRINT TAB(10,6) "Fault number:          "; ERR
3860 PRINT: PRINT: PRINT
3870 PROCRETURN
3880 CLOSE#0
3890 CLS
3900 GOTO 210
3910
3920 VDU 3
3930 VDU 26
3940 VDU 12
3950 PRINT "A fault has occurred while
interpreting a file"
3960 PRINT: PRINT "The filename is: ";Err$
3970 PRINT: PRINT "The fault occurred in line number:
";Err%
3980 PRINT: PRINT: PRINT
3990 PROCRETURN
4000 CLOSE#0
4010 CLS
4020 GOTO 210
4030
4040 REM Commands for Oric-1 plotter
4050 DATA 5,1,"M10,0","X1,15,30","M10,0","X0,-20,20"
4060 DATA 4,C1,S3,"M800,0",S1
```

(continued from previous page)

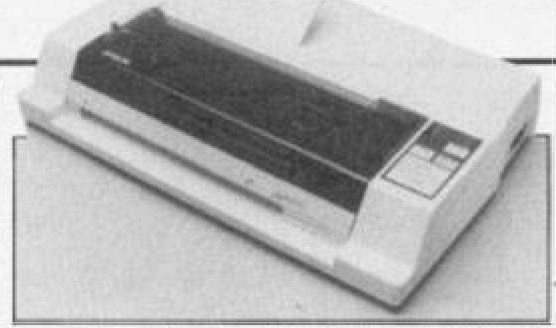
Procinstructs (lines 1190-1290) sets up a text window on the left hand side of the VDU, clears the screen and then reads a sequential text file, printing it to the screen until the End of File marker is reached.

Having loaded the instruction file, the remainder of the procedure to write a new Wychwood program is pretty straightforward. The program line number is printed by line 1100 and line 1110 accept into Z$ any alphanumeric characters that you type on to the keyboard. This is important because many plotter commands contain commas which will terminate the normal Basic Input instruction — pages 277 and 278 in the BBC User Guide.

Wychwood has the facility to turn the contents of the A$ Basic array into a text file. The Wychwood Main Command Level loop will go (if you press T — line 340) to Procspool_Text. Procspool_Text deletes the old file 'T.DEFAULT' on the program disc and then prints the program instructions currently held in memory to a new text file "T.Default" in lines 3480 and 3490.

The plotter is not turned on because Procstart_Up is not called before Procplot. The next stage has to be done manually when you copy the default file from the program disc to the data disc, if you are using two disc drives, and then rename the file to the name of whatever element it will form in the final program.

Because Procspool_Text calls Procplot, which will read existing element text files in the course of printing out a plotter program, it is possible to repeat this process more than



once, increasing the size of the text file each time.

My BBC micro is fitted with version 2 of the Basic interpreter and that means that the Openup instruction should be replaced by Openin for those people working with Basic 1.

Wychwood has changed since last month and the interpreter procedure — Procplot — has grown as I have added new commands to the Wychwood repertoire. In order to make the program easier to adapt to different plotters I have written a new procedure — Proccx — which reads the low level commands that are to be sent to the plotter when a high level program instruction is encountered.

AXIS-1

for example, restores the data pointer to line 4050 and then reads five commands from the data in the line. This method concentrates the data that will need changing when the program is adapted to a different plotter, in one place.

The program is incomplete and must be structured to some extent to suit the particular needs of an individual. Nevertheless, the procedures for writing and editing the contents of a single dimension array, and storing and retrieving the array on floppy discs are complete and working well. Additionally, the program can display large quantities of information to guide the user when Wychwood is operating.

An interpreter of this sort can be used for many purposes, not just for controlling a plotter, and, because it is written in Basic, it is very easy to extend or modify the actions that will be carried out when a particular instruction is executed. The speed of execution should be entirely adquate for many domestic tasks as well as some applications in school laboratories.

Extracting parameters from the text strings in a single element array is not impossible but tends to be a clumsy business using Basic. If the machine you wish to control, an astronomical telescope or an automatic heating and watering system in a greenhouse, for example, requires a fixed number of parameters associated with each instruction, you may find life far easier if you use a multi-dimension array to store the program.

You could use a single dimension string array to store the instuction name and a two or three dimension integer or real array to hold the parameters. The program pointer will identify the current elements in each array, linking the instruction name to its associated parameters or values.

If, to save typing and additional work to create the Command, Element and Editor files, you would like a copy of Wychwood as it is listed in this article with the additional files, write to me at *Your Computer* enclosing your return address in block capitals, a note of whether you want the program on a 40 or 80 track disc and a cheque for £5.75 to cover the cost of the disc, post, packing and copying.

COMMODORE 64, BBC AND SPECTRUM

```
5 REM   HEX LOADER FOR CBM 64   FIG.1
6 REM
10 FOR I=680 TO 727:READA:POKEI,A:T=T+A
20 NEXT:IF T=6716 THEN GOTO 100
30 PRINT"ERROR IN DATA ";T-6716:END
40 DATA 169,1,133,186,169,1,133,184
50 DATA 133,185,169,8,133,183,169,208
60 DATA 133,187,169,2,133,188,169,56
70 DATA 133,251,169,199,133,252,169,251
80 DATA 162,231,160,206,32,216,255,96
90 DATA 68,79,87,78,76,79,65,68
100 SA=51000:LA=52855
110 INPUT"START ADDRESS";A
120 IF (A<SA) OR (A>LA) THEN GOTO 140
130 IF A/8=INT(A/8) THEN GOTO 150
140 PRINT:PRINT"ADDRESS ERROR":GOTO 110
150 T=(A-32768)AND255:PRINTA;:INPUTD$
160 IF D$="END" THEN GOTO 900
170 IF LEN(D$)=20 THEN GOTO 190
180 PRINT"WRONG LENGTH":GOTO 150
190 FOR B=0 TO 7:B$=MID$(D$,2*B+1,2)
200 GOSUB 300:IF E=1 THEN GOTO 280
210 POKE A+B,D:T=T+D:NEXT
220 B$=MID$(D$,18,3):GOSUB 300
230 IF E=1 THEN GOTO 280
240 IF T=D THEN GOTO 260
250 PRINT"CHECKSUM ERROR":GOTO 150
260 A = A+B:IF A<LA THEN GOTO 150
270 GOTO 800
280 PRINT TAB(8+2*B+D)C$"??"
290 B=8:NEXT:GOTO 150
300 E=0:D=0:FOR N=1 TO LEN(B$)
310 C$=MID$(B$,N,1):GOSUB 400
320 IF E=1 THEN D=N:N=4:NEXT:RETURN
330 D=D*16+X:NEXT:RETURN
400 X=ASC(C$)-48:IF X<0 THEN E=1:RETURN
410 IF X<10 THEN RETURN
420 X=X-7:IF X<10 THEN E=1:RETURN
430 IF X>15 THEN E=1
440 RETURN
500 H$="0123456789ABCDEF"
510 FOR A=SA TO LA STEP 8
520 PRINT A;"? ";:T=(A-32768)AND255
530 FOR B=0 TO 7:X=PEEK(A+B):GOSUB 600
540 T=T+X:NEXT:PRINT"=";
560 Y=INT(T/256):PRINT MID$(H$,Y+1,1);
570 X=255 AND T:GOSUB 600:PRINT
580 NEXT:GOTO 900
600 PRINT MID$(H$,INT(X/16)+1,1);
610 PRINT MID$(H$,1+(XAND15),1);:RETURN
```

THE PROGRAMS given here will enable Spectrum, BBC, and CBM-64 owners to download via *Your Computer's* Telsoft service. Each month for each machine we transmit at least one — and usually two — of the main programs appearing in the current issue. Also available is the full user to user communications program, Dialsoft.

So far OE LTD's Telemod 2 and the VTX 5000 modems have been tested with the BBC and Spectrum but the service also works with

```
800 SYS 680:C$=CHR$(34)
810 PRINT:PRINT" TO RELOAD CODE :"
815 PRINT:PRINT"  LOAD"C$"DOWNLOAD",
820 PRINTC$",1,1  <RETURN>"
825 PRINT:PRINT"  THEN TYPE   NEW",
830 PRINT"  <RETURN>"
835 PRINT:PRINT"TO RUN THE PROGRAM",
840 PRINT"  SYS 51000  <RETURN>"
900 PRINT:PRINT:PRINT"1  ENTER DATA"
910 PRINT:PRINT"2  PRINT DATA"
920 PRINT:PRINT"3  SAVE DATA"
930 INPUT Z:ON Z GOTO 100,500,800
```

```
51000 ? A9068D21D08D20D0=3E2
51008 ? A90F8D8602A90E20=2E4
51016 ? D2FFA9008D15D0A9=4DD
51024 ? FF8D8A02BA8E92CE=510
51032 ? 20CAC920C7CB20F8=4D5
51040 ? CAAD80CEC931F023=532
51048 ? C935F014C936D006=43F
51056 ? 208EC74C5BC7A914=410
51064 ? 20D2FF202FCBD0DB=52E
51072 ? 203FC8A92020D2FF=461
51080 ? 4C93C94C4AC82063=411
51088 ? CC2022CDA95B85FD=4F1
51096 ? A9CE85FE2028CDA0=547
51104 ? 002095CC202FCBC9=404
51112 ? 44F00BC954D0ED20=4E1
51120 ? D2FFA901D007A944=4EF
51128 ? 20D2FFA9008DBA20=4B9
51136 ? 25CDA90820ABCCA9=4A3
51144 ? BD85FDA9CD85FEA0=6A0
51152 ? 002095CC2025CD20=383
51160 ? 95CC9848A0048C83=4CC
51168 ? CE20D8C968A92025=4C4
51176 ? CD2095CC9848A906=4C5
51184 ? 8D83CE20D8C9ADA7=5E3
51192 ? CE85FBADA8CE85FC=6EA
51200 ? 68A82060CBA90185=39A
51208 ? B885B998A293A0CE=539
51216 ? 20BDFFAEA9CEACAA=567
51224 ? CEE8D001C82025CD=479
51232 ? A9FB20D8FF20F1CB=597
51240 ? 6020D9CCC90DD00B=3FE
51248 ? A90085C7A92020D2=3E0
51256 ? FFA90D20D2FF60A9=4E7
51264 ? 0D2029C8A90D20D2=306
51272 ? FF602063CCA000A9=43F
51280 ? FF9993CEC8D0FA20=5FB
51288 ? D2CB90FB20D2CBB0=5ED
51296 ? FB8D72CEA0008C7C=4D0
51304 ? CE8C7DCE202ECCAD=4D4
51312 ? 72CE29F0C980D0E4=5C6
51320 ? 20D2CBB0DA9973CE=599
51328 ? C8202ECCC009D0F0=4EB
51336 ? A000AD76CE2980D0=492
51344 ? 0FA52B85FB18A52C=3D8
51352 ? 6D75CE85FC4CAAC8=587
51360 ? AD78CE85FBAD79CE=607
51368 ? 85FC20D2CBB0A820=55E
51376 ? D9CC20D2FFC820D9=607
51384 ? CC202ECCC010D0EA=528
51392 ? A92020D2FFAD75CE=56A
51400 ? 202ECD20D2CBB087=4D7
51408 ? CD7CCEF00BA95820=503
51416 ? D2FF2030C84C57C8=52C
51424 ? 20D2CBB0F8CD7DCE=65D
51432 ? D0EBAD75CEA8B993=687
51440 ? CED00E2030C8A991=4EE
51448 ? 20D2FF4C7EC94C57=51F
51456 ? C8A0008C7CCE8C7D=447
51464 ? CE20D2CBB0F091FB=5BF
51472 ? 202ECCC8CC77CED0=4D3
51480 ? F020D2CBB0E0CD7C=59E
51488 ? CEF000A95820D2FF=4D8
51496 ? 4C57C820D2CBB0CE=4CE
51504 ? CD7DCEF0034C23C9=473
51512 ? 20ACCB2030C8AD75=409
51520 ? CEA8A9009993CEAD=506
51528 ? 84CEC902D02520BC=436
51536 ? CBA9C820F3CBA955=568
51544 ? 2016CDA95020F3CB=432
51552 ? 20C7CBAC73CEC888=54F
51560 ? B993CED02398D0F7=5D4
51568 ? 4C5BC7A9552016CD=3DF
51576 ? 20F1CB4C63C9AC77=4EF
51584 ? CE20D2CB88D0FA20=57D
51592 ? D2CB20D2CB4C47C9=53E
51600 ? 4C5CC8A52B85FBA5=4F5
51608 ? 2C85FCA000B1FB99=52A
51616 ? 2200C8B1FB8523F0=4CE
51624 ? 0BA52285FBA52385=447
51632 ? FC4C9BC918A5FB69=57D
51640 ? 02852D852F8531A5=37B
51648 ? FC6900852E853085=412
51656 ? 32602063CCA9028D=3E1
51664 ? 84CEA90B8D02DE60=4A3
51672 ? 8E81CE8C82CEA200=533
51680 ? A9098DCDCE202FCB=4D4
51688 ? C914F016C90DF051=4E2
51696 ? C924D01920D2FF8D=544
51704 ? C3CEE84CE5C9E000=64B
51712 ? D0E3E000F0DF20D2=554
51720 ? FFCA4CE5C9C93090=554
51728 ? D4C93A901548ADC3=444
51736 ? CEC924F004684CE5=460
51744 ? C968C94190BFC947=4BA
51752 ? B0BB20D2FF38E930=4D5
51760 ? C90A9002E907E005=36A
51768 ? F0AB9DC3CEE84CE5=61A
51776 ? C9E000F0A0E001D0=52A
51784 ? 07ADC3CEC924F095=4FF
51792 ? A92020D2FFA9FF9D=54F
51800 ? C3CEA2008ECFCE8E=544
51808 ? D0CE8ED1CE8ED2CE=659
51816 ? ADC3CEC924D006A9=512
51824 ? 0F8DCDCEE8BDC3CE=5DD
51832 ? C9FFF01D20CBCAB0=5B2
51840 ? 3419BDC3CE6DCFCE=524
51848 ? 8DCFCEA9006DD0CE=566
51856 ? 8DD0CEB020E84C75=534
51864 ? CAADCFCEAC83CE99=642
51872 ? A3CEC8ADD0CE99A3=660
51880 ? CEC8188C83CEAC82=561
51888 ? CEAE81CE602025CD=4ED
51896 ? A200BD41CEC921F0=500
51904 ? 0720D2FFE84CBACA=570
51912 ? 4CDEC9ADCDCE8DCE=65E
51920 ? CEADCFCE8DD1CEAD=6C1
51928 ? D0CE8DD2CE18ADD1=639
51936 ? CE7DCFCE8DCFCEAD=69F
51944 ? D2CE6DD0CE8DD0CE=6BE
51952 ? B005CECECED0E660=625
51960 ? 2063CCA90F8D8602=414
51968 ? A95185FDA9CD85FE=575
51976 ? A000209DCC2025CD=343
51984 ? 209DCC209DCC209D=3DF
51992 ? CC2022CD20A9CC20=3A8
52000 ? 95CC2022CD2095CC=411
52008 ? 202FCB20D2FF608E=421
52016 ? 81CE8C82CE2069CC=4B0
52024 ? 20ECCC20CACCC900=48F
52032 ? D00D20FDCCC931F0=4F0
52040 ? 062001CC4C35CB8D=314
52048 ? 80CEAE81CEAC82CE=597
52056 ? 60AE92CE9A4C5BC7=4CE
52064 ? 2022CDA92285FDA9=465
52072 ? CE85FEA0002095CC=4DA
52080 ? 2025CDA00FA92099=393
52088 ? 93CE88D0FA8D93CE=619
52096 ? 202FCBC914D010C0=417
52104 ? 00F0F520D2FF88A9=58F
52112 ? 209993CE4C80CBC9=50A
52120 ? 0DF00B20D2FF9993=4BD
52128 ? CEC8C010D0DAA920=579
52136 ? 20D2FF60A92020D2=4B4
52144 ? FFA94F20D2FFA94B=58C
52152 ? 20D2FF60A9138D00=452
52160 ? DEA9128D00DE60A9=4CD
52168 ? 538D00DEA9528D00=40E
52176 ? DE60A996188D87CE=547
52184 ? 8C82CEAC82CE2004=4D4
52192 ? CC20ECCCCE87CED0=677
52200 ? 02386020FDCCB0EE=509
52208 ? 60A9FA8C82CEA820=597
52216 ? 04CC88D0FAAC82CE=616
52224 ? 602004CC8AA2A8CA=3EE
52232 ? D0FDAA2069CC6020=454
52240 ? 25CDA90220ABCC20=364
52248 ? 95CCAD8ECE20D2FF=573
52256 ? A92020D2FFA90320=3A6
52264 ? ABCC20D8C9604D7D=48A
52272 ? CE8D7DCEA208AD7D=4AA
52280 ? CE2A9010AD7DCE49=411
52288 ? 088D7DCEAD7CCE49=460
52296 ? 108D7CCE2E7CCE2E=3D5
52304 ? 7DCECAD0E160A000=516
52312 ? A9009900D4C8C018=40E
52320 ? D0F660A99320D2FF=5B3
52328 ? 6048A5A2290FD01F=37E
52336 ? A5D448A5A22910F0=4A1
52344 ? 05A9A44C80CCA920=42B
52352 ? 20D2FFA90085D4A9=51C
52360 ? 9D20D2FF6885D468=53F
52368 ? 6020D2FFC8B1FDC9=620
52376 ? 21D0F6C8602025CD=4B9
52384 ? A90C20ABCC2095CC=46D
52392 ? 60A9058E81CEAAA9=4E6
52400 ? 2020D2FFCAD0FAAE=603
52408 ? 81CE60C914F008C9=505
52416 ? 7FF00160A91460A9=456
52424 ? 7F6020E4FFC9C190=5C4
52432 ? 07C9DBB00338E960=4AF
52440 ? 60C941900EC95B90=494
52448 ? 08C9619006C97BB0=49C
52456 ? 02492060488A4808=2D5
52464 ? 20E1FFD0034C59CB=533
52472 ? 2868AA6860AD00DE=485
52480 ? 49016A9003A90060=250
52488 ? AD01DE6048AD00DE=3C7
52496 ? 49026A6A6860200C=223
52504 ? CDB0FB8D01DE20EC=508
52512 ? CC602025CD2028CD=373
52520 ? A90D20D2FF604829=3A0
52528 ? F06A6A6A6A0930C9=3CA
52536 ? 3A300318690720D2=21F
52544 ? FF68290F0930C93A=31B
52552 ? 300318690720D2FF=2F4
52560 ? 60444F574E4C4F41=2C4
52568 ? 44204D454E552131=243
52576 ? 2020205245434549=228
52584 ? 5645213520202045=1FE
52592 ? 5849542054 4F2042=28A
52600 ? 4153494321362020=22F
52608 ? 2053415645204259=28A
52616 ? 5445532128205553=285
52624 ? 4520122053544F50=26D
52632 ? 209220544F205245=2C4
52640 ? 5455524E20544F20=2CC
52648 ? 4D454E5520292145=28C
52656 ? 4E544552204E554D=2F9
52664 ? 4245522021494620=281
52672 ? 4144445245535320=2E6
52680 ? 495320494E204845=2C8
52688 ? 582C119D9D9D9D9D=476
52696 ? 9D9D9D9D9D9D9D9D=5C0
52704 ? 9D9D9D9D50524546=481
52712 ? 4958205749544820=305
52720 ? 2421535441525420=2E3
52728 ? 4144445245535320=31E
52736 ? 464F522041524541=220
52744 ? 202146494E414C20=1D3
52752 ? 4144445245535320=236
52760 ? 464F522041524541=238
52768 ? 202150524F475241=22C
52776 ? 4D205449544C4520=237
52784 ? 284D415820313620=1E5
52792 ? 4348415227532920=219
52800 ? 21124E4F54205641=21B
52808 ? 4C4944922C205452=2A5
52816 ? 5920414741494E20=249
52824 ? 3A20214449534320=216
52832 ? 4F52205441504520=26B
52840 ? 2820442F54202920=1E0
52848 ? 3F21000000000000=0D0
```

TELSOFT



A reminder of how to use the Telsoft service.

a number of other makes. For the CBM-64 it will initially only be available with the OEL Comms pack together with the Telemond 2 or similar modem; later we hope to adapt the service to work with Commodore's modem.

To enter the download program first type in the hexloader for your machine — figure 1 — and then enter the machine code — figure 2. Once the program has been saved you can run it by entering CALL &6000 on the BBC, SYS 51000 on the CBM 64, RANDOMIZE USR 60000 on the Spectrum.

To find out what is available and how to receive software dial up Colchester (0206) 8068. This audio recorded information line will also advise you which telephone numbers to ring for the 300 and 1200 bit/s services.

When a program you want to download is on line, make sure your modem is set up and dial the number appropriate to its speed. As soon as you hear the modem tones switch the modem to line and replace the receiver. Select Option 1 from the menu — Receive. After a block of data is received you will see "OK" printed if there are no errors, otherwise the program will wait for the blocks to come round again. When the "Program loaded OK" message appears return to the Telsoft menu and select Option 5. You can now save and run the program.

Note that CBM-64 owners will need to use Option 6 if machine code is to be saved.

Figure 1. BBC.

```
10 REM BBC HEX CODE LOADER
15 HIMEM=&69FF
20 CLS:PRINT
30 INPUT " START ADDRESS (Hex)";A$
40 A=EVAL("&"+A$)
50 IF A>&6F87 THEN 280
60 IF A<&2A00 OR A>&6FE7 THEN 20
70 PRINT ~A" ";
80 INPUT ":" B$,C$
90 IF LEN(B$) <>16 THEN 50
100 T=0
110 FOR N=0 TO 7
120 X$= MID$(B$,2*N+1,1): GOSUB 300
130 IF E=1 THEN 260
140 X$= MID$(B$,2*N+2,1): GOSUB 300
150 IF E=1 THEN 260
160 B= EVAL("&"+MID$(B$,2*N+1,2))
170 ?A=B:A=A+1:T=T+B
180 NEXT
190 FOR M = 1 TO LEN (C$)
200 X$=MID$(C$,M,1):GOSUB 300
210 IF E =1 THEN A=A-1: GOTO 260
220 NEXT
230 IF T= EVAL("&"+C$) THEN 50
240 PRINT "CHECKSUM ERROR !"
250 A=A-8:GOTO 50
260 PRINT "TYPING ERROR !"
270 A=8*(A DIV 8):GOTO 50
280 *SAVE "DOWNLOAD" 6A00 6F87
290 END
300 E=0:IF ASC(X$)<48 THEN E=1:RETURN
310 IF ASC(X$)<58 THEN RETURN
320 IF ASC(X$)<65 THEN E=1:RETURN
330 IF ASC(X$)>71 THEN E=1
340 RETURN
```

Figure 2. BBC.

```
6A00 :A9CBA0FEA20120F4,4C6
6A08 :FF20616C20406DC9,38A
6A10 :31F000C934F0E9C9,4CB
6A18 :35F0064C0C6A4C47,200
6A20 :6AA90C20E3FFA9E8,482
6A28 :A000A2FF20F4FFA9,4FD
6A30 :03A20020F4FFA902,363
6A38 :A20220F4FFA9CBA0,4CB
6A40 :FEA20020F4FF60A9,4BC
6A48 :0C20E3FF20F76BA9,439
6A50 :15A20120F4FFA000,3EB
6A58 :A9FF0099056FD0FA,587
6A60 :A915A20120F4FF20,394
6A68 :0C6C90FB200C6CB0,348
6A70 :FBA0000477047804,416
6A78 :79047A047B057020,38B
6A80 :056DA57029F0C900,489
6A88 :D0E2200C6CB0D099,46B
6A90 :7100C820D56DC009,364
6A98 :D0F0A000A5742900,422
6AA0 :D000A51C057610A5,354
6AA8 :1D65730577200C6C,209
6AB0 :000520E3FFC82005,524
6AB8 :6DC010D0F0A57320,435
6AC0 :B26D200C6C00A0C5,3CC
6AC8 :7AF000A95020E3FF,478
6AD0 :20E7FF4C676A200C,34F
6AD8 :6CD00CC570F000A9,40C
6AE0 :5820E3FF20E7FF4C,4AC
6AE8 :676AA573A099056F,43E
6AF0 :D00E20E7FFA90820,380
6AF8 :E3FF4C836B4C676A,469
6B00 :A000847A847B200C,2C9
6B08 :6CB0F2917620D56D,477
6B10 :CBC475D0F1200C6C,45A
6B18 :B0E3C57AF000A950,4CE
6B20 :20E3FF20E7FF4C67,4DB
6B28 :6A200C6CB0CFC57B,3C1
6B30 :F000A95020E3FF4C,447
6B38 :676A20C76B20E7FF,429
6B40 :A573A0A90099056F,3F6
6B48 :A50AC902D0582007,419
6B50 :6BA9C820556CA955,3B8
6B58 :20306EA95020556C,298
6B60 :A915A20120F4FF20,394
6B68 :F76BA471C0000905,585
6B70 :6FD05190D0F7A90C,4A4
6B78 :20E3FF20A56DA95A,437
6B80 :0502A96F0583A907,307
6B88 :20006E20F86D20A0,2DB
6B90 :6DA90520006EA900,2DA
6B98 :20E3FF20F06DA9D2,502
6BA0 :20E0FF4C0C6AA955,3BF
6BA8 :20306EA99620556C,2DE
6BB0 :4C6A6BA475200C6C,2D2
6BB8 :00D0FA200C6C200C,316
6BC0 :6C4C406B4C6C6AA9,336
6BC8 :2020E3FFA96F20E3,43D
6BD0 :FFA96B20E3FF60A9,51E
6BD8 :9CA000A6BAE002D0,41E
6BE0 :00A21320F4FFA212,387
6BE8 :20F4FF60A29120F4,4C0
6BF0 :FFA29620F4FF60A9,553
6BF8 :9CA000A6BAE002D0,41E
6C00 :EBA25320F4FFA252,4E7
6C08 :20F4FF6010A99685,44F
6C10 :0F847EA991A20020,38D
6C18 :F4FFB009C007D005,448
6C20 :A6604C0C6AA47E20,204
6C28 :496CC60FD0023860,374
6C30 :A50AC902D0062079,369
6C38 :6E00EC60A991A201,447
6C40 :20F4FF90A47EB0DF,55C
6C48 :600AA2D2CAEBCAD0,5AA
6C50 :FBAA60A9000047EA0,458
6C58 :20496CB0D0FAA47E,449
6C60 :60A9EBA000A2FF20,452
6C68 :F4FFA900050AA90C,460
6C70 :20E3FF20AB6DA904,3E4
6C78 :20006EA9090582A9,2F0
6C80 :6F0503A00020F06D,39C
6C88 :20156DC941F000C9,370
6C90 :42F011C943F0174C,3A2
6C98 :616CA900A20120F4,335
6CA0 :FF4CB76CA900A203,3C4
6CA8 :20F4FF4CB76CA900,433
6CB0 :A20420F4FFE60AA5,4CE
6CB8 :7C20E3FFA47E20A0,46B
6CC0 :6DA90020006E20F8,2C4
6CC8 :6DA01720156DC941,2D0
6CD0 :F000C942F011C943,413
6CD8 :F0174C616CA907A2,372
6CE0 :0120F4FF4C096DA9,37F
6CE8 :07A20320F4FF4C09,314
6CF0 :6DA907A20420F4FF,3D6
6CF8 :E60AA50AC907D009,443
6D00 :A9EBA000A20120F4,3E8
6D08 :FFA57C20E3FF2053,495
6D10 :6C20536C6020AB6D,2E3
6D18 :A90520006E20F86D,2C1
6D20 :20AB6DA90520006E,274
6D28 :20F06D20AB6DA905,36B
6D30 :20006E20F06D20AB,2DE
6D38 :6D047EA90320006E,2A9
6D40 :A9D220E0FF057C60,4DB
6D48 :A90C20E3FF20AB6D,3EF
6D50 :A90720006EA99A05,306
6D58 :02A96E0583A00020,361
6D60 :F06D20AB6D20996D,3C0
6D68 :20996D20996D20AB,317
6D70 :6DA90A20006E20F8,2C6
6D78 :6D20AB6DA9022000,270
6D80 :6E20F06D20AB6D20,34B
6D88 :E7FFA9D220E0FF40,5A0
6D90 :A90FA20020F4FF60,3D5
6D98 :6A098020006E20F0,2B7
6DA0 :6D20AB6D6020AB6D,33A
6DA8 :20AB6D20E7FF20E7,445
6DB0 :FF604829F06A6A6A,3FE
6DB8 :6A0930C93A300318,1F1
6DC0 :690720E3FF60290F,312
6DC8 :0930C93A30031069,1F0
6DD0 :0720E3FF60457005,3AE
6DD8 :7BA200A57B2A900C,3B0
6DE0 :A57B4900057BA57A,390
6DE8 :4910057A267A267B,299
6DF0 :CAD0E86020E3FFC8,5AC
6DF8 :B102C900D0F6C860,4F7
6E00 :B67DAAA92020E3FF,470
6E08 :CAD0FAA67D60C97F,55F
6E10 :D000A90A20F4FFE0,4FD
6E18 :00F012A97FC92000,3C3
6E20 :0EC90AF00AC90DF0,3A1
6E28 :06C907F002A90060,2D1
6E30 :057CB67D047EA991,440
6E38 :A20120F4FFA903A2,404
6E40 :0720F4FFA996A200,403
6E48 :20F4FF902902F0F4,4BA
6E50 :A47CA997A20920F4,41F
6E58 :FFA903A20420F4FF,464
6E60 :A991A20020F4FFB0,49F
6E68 :09C007D005606B4C,2C1
6E70 :0C6AA57CA67DA47E,3DC
6E78 :60047EB67DA996A2,446
6E80 :0020F4FF902901F0,3CD
6E88 :0BA996A20920F4FF,400
6E90 :9010900130A67DA4,340
6E98 :7E60444F574E4C4F,2B1
6EA0 :4144494E47204D45,215
6EA8 :4E550D3120202052,193
6EB0 :4543454956450D34,1F2
6EB8 :2020205345542042,1AE
6EC0 :6175642052617465,2E6
6EC8 :0D35202020455849,188
6ED0 :5420544F20424153,2BD
6ED8 :49430D454E544552,217
6EE0 :204E554D4245520D,1F6
6EE8 :2020555345204354,1EC
6EF0 :524C2D4720544F20,1F5
6EF8 :52455455524E2054,254
6F00 :4F204D454E552029,1ED
6F08 :0D53455420545241,200
6F10 :4E534D4954204261,24E
6F18 :756420526174650D,292
6F20 :4120202037352042,16F
6F28 :6175640D42202033,1FC
6F30 :303020426175640D,209
6F38 :4320313230302042,1B8
6F40 :6175640D53455420,253
6F48 :5245434549564520,223
6F50 :4261756420526174,2C3
6F58 :650D50524F475241,23D
6F60 :4D20204C4F414445,1F2
6F68 :4420206F6B0D5052,2BD
6F70 :45535320414E5920,213
6F78 :4B455920464F5220,218
6F80 :4D454E550D202020,1A2
```

Figure 1. Spectrum.

```
5 REM SPECTRUM 48k          fig 1
10 REM Hex Code Loader
15 CLEAR 59000
20 POKE 23658,8: CLS : PRINT
30 INPUT "Start Address ";a
50 IF a>61135 THEN GO TO 280
60 IF a<60000 THEN GO TO 20
70 PRINT a;
80 INPUT " :";b$
85 IF b$="END" THEN GO TO 280
90 IF LEN b$<>20 THEN GO TO 260
100 LET t=a-256*INT (a/256)
110 FOR n=0 TO 7
120 LET x$=b$(2*n+1 TO 2*n+1)
125 GO SUB 300: LET y=x
130 IF e=1 THEN GO TO 260
140 LET x$=b$(2*n+2 TO 2*n+2)
145 GO SUB 300: LET y=y*16+x
150 IF e=1 THEN GO TO 260
170 POKE a,y: LET a=a+1
180 LET t=t+y: NEXT n: LET y=0
190 FOR m=1 TO 3
200 LET x$=b$(17+m TO 17+m)
205 GO SUB 300: LET y=y*16+x
210 IF e=1 THEN LET a=a-1: GO TO 260
220 NEXT m
230 IF t=y THEN PRINT ":";b$: GO TO 50
240 PRINT "Checksum Error"
250 LET a=a-8: GO TO 50
260 PRINT "Typing Error"
270 LET a=8*INT (a/8): GO TO 50
280 SAVE "download"CODE 60000,1136
290 POKE 23658,0: STOP
300 LET e=0: LET x=CODE x$-48-7*(x$>"9")
310 IF x<0 OR x>15 THEN LET e=1
320 RETURN
```

Figure 2. Spectrum.

```
60000 :CD15EDC307ECCD15,4C7
60008 :EDCD36ECCD66EDCD,631
60016 :50EDCD47EE30FBCD,5AF
60024 :B0EDFE31CA99EAFE,69A
60032 :35CA07EAC366EACD,500
60040 :15ED3EFACD04EDCD,5FD
60048 :15EDC9CD15EDC366,553
60056 :EACD66ED11E5EE06,58C
60064 :003EFF121310FCCD,458
60072 :15EE11CDEE06173E,3D2
60080 :20121310FCCD1FED,3DA
60088 :30F0CD50EDCD1FED,5B0
60096 :30FB3265EF3E0032,3E9
60104 :6CEF326FEF3270EF,544
60112 :3A65EFCDEBEC3A65,5A1
60120 :EFEAF0FE0020DE0E,627
60128 :091165EFCD1FEDDA,501
60136 :AAEA1312CDEBEC0D,552
60144 :20F23A69EFE60020,51A
60152 :0021485C3A66EF0E,36C
60160 :004709226BEF0E00,1DA
60168 :11CDEECD1FED309A,47F
60176 :12130CCDEBEC79FE,45C
60184 :1020F03A66EFCDB1,447
60192 :ECCD1FEDDAAAEA21,574
60200 :6FEFBE20133E5011,326
60208 :E0EE12133E0012CD,348
60216 :D7ECCDA6ECC3AAEA,681
60224 :CD1FEDDAAAEA2170,518
60232 :EFBE20E121E5EE3A,524
60240 :60EF056F3E000C67,3CC
60248 :3E000E2000CDD7EC,40F
60256 :3E2132005CC3FFEB,402
60264 :3E00326FEF3270EF,3C7
60272 :ED506BEF0E00CD1F,40C
60280 :EDDAAAEA3273EFCD,634
60288 :E0EC3A60EFFE0020,506
60296 :053A69EFE6003A73,432
60304 :EF12130C3A6AEF09,3FC
60312 :200CCD1FEDDAAAEA,508
60320 :216FEF0EC220E0CD,504
60328 :1FEDDAAAEA2170EF,5A2
60336 :0EC220E03E6F32E2,509
60344 :EE3E6032E3EE3E00,490
60352 :32E4EE3A005CFE21,501
60360 :2003CD15EECD07EC,553
60368 :CDA6EC21E5EE3A60,5C5
60376 :EF056F3E000CA736,422
60384 :0021E5EEED4B66EF,561
60392 :0C7EFE00C20DEA23,4FC
60400 :0D20FA3EFACD04ED,509
60408 :3E01D3FEC366EACD,5E0
60416 :1FED30FBC30DEAF3,594
60424 :0603AFD3FF10FB3E,3D0
60432 :40D3FF3EFFD3FF3E,56F
60440 :31D3FF3E0F320F5C,385
60448 :320D5C32405C3E01,250
60456 :D3FE21915CC09EFB,56B
60464 :CD50EDC366EACD15,52F
60472 :EECD66ED3E01D3FE,556
60480 :2165EE3E00CD0FEC,442
60488 :CD04ECCDA3ECCDA6,654
60496 :EC23CD77ECCD77EC,58F
60504 :CDA0ECCD04ECCDA6,661
60512 :EC233E0DCD0FECCD,4CF
60520 :04EC23CDA3EC3E03,498
60528 :CD0FECCD04ECC9CD,680
60536 :A3EC3E07CD0FECCD,561
60544 :04EC23C97EFE00C8,520
60552 :CD08ED23C304ECFE,651
60560 :00C8F53E20CD08ED,520
60568 :F130C30FECCDA0EC,650
60576 :CDA3ECCDA6EC3E0D,5A6
60584 :CD08ED3EFF320C5C,574
60592 :C9F513E6F0CB1FCB,60C
60600 :1FCB1FCB1FF630FE,4CF
60608 :3AFAC6ECCA071213,490
60616 :F1E60FF630FE3AFA,606
60624 :D4ECC6071213C921,46C
60632 :CDEEE5CD04ECE106,69C
60640 :173E20772310FC3E,339
60648 :0077C9E52170EFAE,53B
60656 :77C50E007EA7CB17,449
60664 :30007EEE00773A6F,3C9
60672 :EFEE10326FEF3721,305
60680 :6FEFCB1623CB160D,350
60688 :20E2C1E1C9110501,394
60696 :216A00CD0503C93E,32F
60704 :963277EFCD47EDDA,529
60712 :2EEDF1C366EACDAC,5C0
60720 :ED7BEA01F602D3FE,540
60728 :AF2177EF35200237,2FC
60736 :C9CD77ED30EBC9CD,5F0
60744 :47EED0FEC0C037C9,5E6
60752 :F5D0FF3A01EFFE00,5C7
60760 :20043E3610023E37,187
60768 :D3FFDB7FF1C9F53A,675
60776 :01EFFE0020043E36,376
60784 :D3FFCD50EDF1C93E,644
60792 :00D0FFE60037C0D0,59.
60800 :FFE60237C0D0FFE6,426
60808 :302004DB7FA7C93A,3E0
60816 :01EFFE0020043E37,397
60824 :10023E36D3FFDB7F,452
60832 :C9CD47ED3A73EFD0,50E
60840 :F1C366EAF53ED23D,5EE
60848 :20FDF1C9CDACED3D,62A
60856 :20FAC9C5D5E5F5FE,7B0
60864 :7F2013CDF9EDFE0C,537
60872 :200CFE0D20053E20,20A
60880 :D73E0DD718103E20,34F
60888 :D73E00D73A005CFE,4E0
60896 :2120033E00D73E5F,2E6
60904 :D73E00D7F1E1D1C1,640
60912 :C9FE07201CFECD20,4F3
60920 :19FE0C2014FE0020,300
60928 :10FE0D200CFE20FA.367
60936 :0FEEFE00FA11EE3E,4BA
60944 :00C93E07C9CD6B0D,32C
60952 :3E02CD01163E1032,1C4
60960 :095CC93E121601CD,302
60968 :1122C93E121600CD,257
60976 :1122C9C5D5E53E02,3E0
60984 :CD0116CD47EE30F0,451
60992 :CD5CEEE1D1C1C93A,5CD
61000 :3B5CCB6F200C3A00,20F
61008 :5CF5213B5CCBAEF1,4C3
61016 :A7C937C9F5111000,30E
61024 :CD10EDF1C9444F57,4D6
61032 :4E4C4F4144494E47,2B4
61040 :204D454E55003120,216
61048 :2020524543454956,276
61056 :4500352020204578,217
61064 :697420746F204261,320
61072 :7369630020205573,2DF
61080 :652053796D626F6C,393
61088 :2053686966742020,300
61096 :204720746F205265,2C9
61104 :7475726E20746F20,39C
61112 :4D454E5520290045,27B
61120 :4E544552204E554D,309
61128 :4245522000000000,1C1
```

BEGINNERS first bytes

Starting out in home computing? First Bytes is for you. Just write to *Your Computer* with any hardware or software problems, no matter how small or simple.

I could do that...

In support of his one man campaign against the structuralists John Ransley asked you to desing a haywire program for September's competition. It had to combine a loop with a liberal sprinkling of Gotos and Gosubs; and, most importantly, there were to be no elaborate modules. M. Wright, 2 Rye Lane, Halifax, HX2 0QB, wins the £15 prize for his Spectrum Ducksheet program. While the program may not be as messy as John Ransley would like, the author has successfully managed to avoid any suggestion of a logical structure. This month's competition continues our policy of reviving the arcade classics. A Basic version of Space Invaders is in the pipeline. We would like you to follow it up with Breakout in Basic. Remember that the program should be as compact as póssible — no more than 20 lines long, and don't worry about sacrificing non-essential features.

```
  10 GO TO 140
  20 REM ** duck **
  30 LET a$=a$(20)+a$( TO 19): PRINT AT 8,0; PAPER 7;a$: RETURN
  40 REM ** fire **
  50 FOR n=18 TO 3 STEP -1
  60 PRINT AT n,15;".": IF n/2=INT (n/2) THEN GO SUB duck
  70 PRINT AT n,15;" ": NEXT n: PRINT AT n,15; PAPER 7;" "
  80 IF a$(16)="A" THEN PRINT AT 2,15; PAPER 7; INK 2; FLASH 1;"A";AT 4,11; PAPER 6; INK 0; FLASH 0;"Well done"
  90 INPUT "Press ENTER to continue";a$: RUN
 100 REM ** game **
 110 GO SUB duck
 120 IF INKEY$<>"" THEN GO TO fire
 130 PAUSE 3: GO TO game
 140 REM ** initialise **
 150 LET duck=20: LET fire=40: LET game=100
 160 FOR n=0 TO 23: READ a: POKE USR "a"+n,a: NEXT n
 170 DATA 0,0,0,7,196,126,60,0,0,0,0,0,0,0,0,56,40,56,0,24,24,48,48
 180 BORDER 4: PAPER 4: CLS : PRINT AT 11,15;"B";AT 12,15;"C": REM Graphic B and C
 190 LET a$="  A    A A    A": REM a$ needs 20 characters with Graphic A's scattered at random.
 200 GO TO game
```

A bluffers' guide to micros

REMEMBER THE computer-book boom, with each new machine followed by enough "instant books" to start a paperchase to Alpha Centauri? *The MicroGrot Explained ... Revealed ... Unzipped ... Hit With A Sledgehammer.*

Bluff reigned supreme. Some of these books managed to be less useful than the supplied manuals, which generally takes some doing. A programmer's idea of a manual opens with several chapters describing special and incomprehensibly powerful features: only experienced users know to turn to Appendix F, section VI, subsection 3.14, to find the footnote on how to switch the machine on and load programs.

And those were people who *knew* about the wretched gadgets. In computer publishing's days of glory, *The MicroGrot Explained* could be written by anyone, and usually was. The following bluffer's tales are true, but names are omitted to protect the innocent (me) from the guilty ...

"Why not write a *Basic For The Very Stupid* book for your computer?" asked a friend who'd written two. "Money for old rope."



"I've only had it a month," I said evasively.

He gave me a look. "I haven't even *got* one, and I've sold two books on it. Haven't written them yet, but it should be a doddle. It's all in the other books."

Far off, you could hear the crash of mighty pines being felled.

Another pal gloated over lucrative video commissions, with masterworks to be delivered within the week. With gritted teeth I quote: "It's great fun though — and rather silly — we've only had the Spectrum for a fortnight and we have to appear both wonderfully knowledgeable and highly skilled. This is difficult to put over when you have to spend five minutes searching for the word "or" or "to" or whatever ..."

Something snapped inside me when the author of *A Moron's Guide To The Spectrum* dropped in to research his *Moron's Guide To The Commodore 64.* Conscientiously he spent whole minutes researching my 64; meanwhile I flipped through his hideously matrix-printed draft introduction. "Ha ha," I quipped, "it says *Spectrum* here — anyone would think this was your Spectrum introduction again, and you missed that one when you changed the name to CBM-64."

"Er yes well um," he said sheepishly. "That's right."

After this it seemed quite possible to believe people had published authoritative, hands-on explanations of the QL before ever seeing the machine. Like lifelong nuns writing sex manuals.

It's harder now to flog easy-to-read, easy-to-forget works titled *Rearranged Bits From All The Other Books On The Spectrum.* I've given the thumbs-down to a couple myself: because I'm a world authority on not writing computer books, publishers occasionally ask me in to sneer at submitted manuscripts. My favourite was a book of CBM-64 graphics programs — *none* of which worked on my 64. There are three variants of the machine, distinguished by what happens when you reach page 64:

POKE 1524,81

The resulting blot was once white, is now cursor coloured.

The dwindling boom is familiar news to SF fans. Decades ago, a dreadful outfit called Badger Books found any SF would sell, and published 159 hackworks by a single author (R.L. Fanthorpe) who wrote one each weekend. It would be libellous to identify the Fanthorpes of computer publishing — but just as Badger poisoned the 1960s SF market, the exploiters have made home-micro books a bit of a joke.

And next, for the dim...

ONE OF THE main uses of a micro, or any other type of computer, is the manipulation of large volumes of data, as a single mass, or split up by any given criteria. In Basic, there are several simple commands which are at the heart of any data handler — arguably the most useful are Dimension, For, and Next.

Dim allows a user to set up an *array* of similar variables, so that, instead of using, say, A to Z for the first 26 variables entered, e.g.:

```
10 INPUT A
20 INPUT B ...
260 INPUT Z
```

it is possible to have each variable as a different point on the "number line" of the *one-dimensional array,* A:

```
10 DIM A (26)
20 INPUT A (1) ...
270 INPUT A (26)
```

(continued on next page)

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Line 10 sets up the array of variables, and from there onwards, they may be treated as independent variables. The advantage of this system only really comes to light when the array is used in conjunction with a *loop*. A simple loop can be set up using Goto, with a counter and decision to get out of it at the right time. This principle is used in the program below, which does just the same as the previous one, but in 22 less lines:

```
10 LET COUNT = 0
20 DIM A (26)
30 LET COUNT = F COUNT + 1
40 INPUT A (COUNT)
50 IF COUNT < 26 THEN
   GOTO 30
60 . . .
```

Using a For . . . Next loop, the program can be simplified still further:

```
10 DIM A (26)
20 FOR C = 1 TO 26
30 INPUT A (C)
40 NEXT C
```

The two programs function identically, but with the second version, the programmer does not have to bother keeping count himself; nor does he have to remember which line the original For command is on: the computer works out where to go to itself.

The same principle can be used for strings of letters, but, on the Spectrum, the length of the string must be defined, as though, on another computer, a two-dimensional array was being created:

```
10 DIM A$ (20,10)
```

will, on the Spectrum, create an array of 20 words, each 10 letters long. This is, in effect, the same as creating a two-dimensional array of characters, and, due to the string splicing commands, can be treated exactly as that. In most Basics, A$(20) is all that is required for a string array, and the variables can be of any length. Although the Spectrum's approach is more logical, and requires less memory, the latter system is more suited to data comparison and retrieval.

Once an array is set up, the component variables may be manipulated in the same way as any variable, but they may also be treated as a group, e.g.:

```
10 FOR X = 1 TO 26
20 LET A(X) = A(X) + 1
30 NEXT X
```

will add one onto each number in the array A. Using Step, every second value, for example:

```
10 FOR X = 1 TO 26 STEP 2
20 LET A(X) = A(X) + 1
30 NEXT X
```

. . . or only the second 13:

```
10 FOR X = 14 TO 26
20 LET A(X) = A(X) + 1
30 NEXT X
```

So far, arrays of only one "dimension" have been looked at; but any number of dimensions is possible: Dim A (10,10) creates a 2-D array of 10 numbers by 10 numbers (100 in all), and Dim A (10,10,10) will create a 3-D array. In practice, most programs seldom use more than two dimensions, so, to turn back to the 10 by 10 array:

Each of the primary "columns" has another 10 sub-rows: there are numbers ranging from A(1,1) through A(1,2). . . A(1,10). . . A(2,1). . . A(10,10). This capability is important when *sets* of data must be processed: e.g. when programming a "Monopoly" card. The dimensions needed for "Rent — six values for each card, of which there are 22 — would be R(22,6).

Every card is referred to by a number (1 to 22), and each house state by a number from one to six, where one is "site only", two is "with one house", etc. up to six, which is "Hotel". The rent, then, for three houses, on property 18 is in R(18,4). The names of the properties could be stored in a string array, e.g. P$(22), so P$(1) would be "Old Kent Road".

In practice, it would be extremely tedious to enter all these values each time a game was to commence, or to write a program where the data are given on a one-to-one basis with their variable's name, and to alleviate this chore, there exists the Data command set to do this automatically.

After the command Data in a program, there exists a storage place for numbers or strings, e.g.

```
10 DATA "Old Kent Road",2,10,
   30,90,160,250,"Whitechapel
   Road",4,20,60,180,320,450
   (etc)
```

The program below reads this data line in the same basic way as the previous programs inputted data, but as there are two dimensions, it uses a "nest" of two loops, X and Y.

```
10 DATA (as above)
20 DIM R(22,6): DIM P$ (22)
   (P$ (22,20) on the Spectrum)
30 RESTORE
40 FOR X = 1 TO 22
50 READ P$(X)
60 FOR Y = 1 TO 6
70 READ R(X,Y)
80 NEXT Y: NEXT X
```

Restore resets the Data market so that data is read from the beginning of the line onwards. Read reads the data into the specified variable, and moves the market on one "data element", so that the next item is read next time. Note that, as there is only one string element to be read for each property, the Read P$(X) command is outside the inner nested loop.

BEGINNERS
first bytes



How to come forth

FORTH IS very different from Basic and, indeed, most other high-level languages. It was originally developed by Charles Moore to control radio telescopes at the Kit Peak National Observatory, Arizona, in the early 1970s.

Described as a "high-level" language, Forth is effectively an extensible "macro language". It comes with a standard dictionary of words — i.e. macro definitions — which can be used and expanded to create the user's program. Each new word can be made up of those already in the dictionary or with assembly language mnemonics.

A macro definition is a collection of similar, or lower, level commands which make up a higher level function. This creates a language on a higher level than machine code but with very nearly the same execution speed.

Since each word can be used in successive words the user ends up with a program which is executed by typing one single word. The outcome of all this is that the user creates virtually a new language based around the original dictionary, so you can tailor the language to meet your requirements.

What really makes Forth a high-level language is that fully structured programming methods are employed as a fundamental feature. This is done through the use of control structures such as If . . . Else . . . Endif and Begin . . . While . . . Repeat. They give it many advantages over Basic such as the ability to support recursive structures.

Another major difference between Forth and Basic is the way in which the former evaluates arithmetic expressions.

Forth employs the use of a stack on which data are held and operated on. All access is to the top of the stack. Therefore, the last number on is the first off.

Operations upon the data use a convention called Reverse Polish Notation (RPN). As an example: 1 2 + 3 x is the RPN equivalent of (1 + 2)x3. As can be seen the operators are input after the data upon which they operate.

The 1 and 2 go on to the stack where they are added together. The result is placed at the top and the 3 is placed on the stack and then multiplied by the previous result. The final result is again left at the top of the stack.

Unlike nearly all implementations of Basic, standard Forths use integer arithmetic for their operations. In most cases they can handle up to 32-bit precisions if required. Floating-point routines can be incorporated but these would result in a reduction in execution speed.

Debugging a Forth program can be a real headache. This is mainly because of the way in which a Forth program is built up.

TOP★ TIPS

SMOOTH MESSAGE

This program allows you to add the final touch to that game you have just finished writing, or it could be used to customise any other programs you have.

The message is Poked into memory at location 32122 onwards, along with the required length and colour. When the routine is executed, the message is scrolled slowly and smoothly — not a trace of flicker — across the whole 32 colomns of the screen using the extreme bottom of the screen.

```
10 DATA 0,0,0,0,0,0,0,0
20 DATA 118,33,255,88,17,32,1,
14
30 DATA 0,6,32,126,83,119,43,1
6
40 DATA 250,25,13,32,244,201,1
,40
50 DATA 117,22,0,33,255,80,30,
0
60 DATA 10,7,203,18,2,126,179,
119
70 DATA 3,197,1,0,1,9,193,21
80 DATA 32,236,201,30,0,111,41
,41
90 DATA 41,17,0,61,25,1,0,0
100 DATA 17,48,117,237,176,201,
33,224
110 DATA 80,58,168,117,118,35,1
85,193
120 DATA 32,247,33,169,117,126,
79,35
130 DATA 126,229,197,205,167,11
7,6,8
140 DATA 197,205,56,117,205,70,
117,193
150 DATA 16,240,193,225,13,32,2
32,201
200 CLEAR 29999: RESTORE 0: FOR
x=30000 TO 30119: READ A: POKE
x,A: NEXT x
300 INPUT "Enter Length Of Mess
age ";L: POKE 30121,L
400 CLS
500 INPUT "Now Enter The Messag
e ";M$: FOR x=1 TO L-1: POKE 301
21+x,CODE M$(x)-32: NEXT x
600 INPUT "Enter Colour Value "
;C: POKE 30120,C: RANDOMIZE USR
30078
```

DOUBLE HEIGHT

This program for the Amstrad is designed to let you use double height characters in all modes. Simply type out the demonstration program and Run it and it will save the code for you. When you wish to re-use it you must load the code and type CALL&AAE0 (Enter) to set up the RSX. You can then use it like this:

10 a$="Hellow World"
20 locate 4,4:pen 2
30 a$""+a$
40 1double,§a$

Paul Mason

```
10 MEMORY &AADF
20 FOR i=0 TO [illegible]
40 FOR j=0 TO 15
50 [illegible]
60 NEXT
70 PRINT [illegible]
80 IF [illegible] THEN PRINT "checksum error in line"
[illegible]
90 NEXT
100 PRINT "SAVING DOUBLE.B [illegible]"
110 SAVE "double",B,&AAE0,[illegible]
120 CALL &AAE0
130 MODE 0:PEN 1:PAPER 3:LOCATE 7,2:a$="This is" [illegible]
140 a$="Double Height" [illegible]
150 END
1000 DATA [illegible]
1010 DATA [illegible]
1020 DATA [illegible]
1030 DATA [illegible]
1040 DATA [illegible]
1050 DATA [illegible]
1060 DATA [illegible]
1070 DATA [illegible]
1080 DATA [illegible]
```

RESPONSE *Frame*

Do you have a problem related to your micro? Our panel will do their best to help. Please include only one question per letter and mark it "Response Frame". Alternatively, perhaps you have an idea you'd like to pass on to others. Why not write to us with your top tips?

FASTER SAVE

■ **Having seen many games over the past year with Hyperloads and a few games that have no Border, I have tried to write my own, also allowing me to disable Break completely by stopping the keyboard scan. The problem that I have come up against is that having found the Rom routine, how do I successfully transfer the routine to Ram so as it can be fiddled with? I think I know how to stop the border but I can't make it save faster.**

Andrew Shoren,
West Drayton,
Middlesex.

FIRST OF all the thing that you must understand is that there are relative and absolute jumps in the routine (relative means jump backwards or forwards by X bytes. Absolute jump means jump to a given address). Get yourself a good assembler/disassembler and a copy of *The Complete Rom Disassembly* by Dr Ian Logan. As you will see, the routine to save is at 1218D/04CZH and is approximately 148 bytes long. As you will know, every time the routine is executed (by leaving an "edge" on the tape) the Border changes colour by way of the Out instruction. All that you do is NOP them out or if using an assembler leave them out altogether. Define the Border colour from Basic and jump into the routine and you're away.

To hypersave is a more difficult job. The highest speed I have ever attempted to use was in approx 1/7th of the normal time. Unfortunately the computer then wouldn't listen to it when I tried to load it back.

What happens is that the program waits for a set period of time before it either sends or listens for another pulse. If you decrease this length of time you will save far quicker. The delay is stored in the B register at 051FH (normal value 62D) and must be decreased (to about 45150).

To sum it up you can either copy the routine into Ram via a For-Next loop and search out all the absolute jumps (code 195) and replace the addresses with + however many bytes further up in the memory you put it. Otherwise use an assembler and copy the mnemonics from Dr Logan's book.

Craig Rawston.

PSEUDO BLEEP

■ **Could you briefly explain how I could simulate the Beep function in machine language, also how do some programs manage to make the music play far louder than normal?**

Michelle Pendleton,
Shepperton,
Surrey

FIRST, TO simulate the Sinclair Beep you need to use the following routine:

```
LD HL,Pitch
LD DE,Duration/Frequency
CALL 03B5H (Beep routine in Rom)
Ret
```

To work out the duration just multiply the time you want the noise to last by the frequency in HZ. Now if you want to make the sound louder, what you have to do is write a twin or three channel sound routine.

Try the following little ditty that I've concocted:

```
LD A, (5C48H)
RRA
RRA
RRA
LD B,Duration
LOOP LD C,254
DEC H
JR NZ, LOOP
XOR 16
OUT (C),A
LD H, FREQ 1
DEC L
JR NZ, LOOP
XOR 16
OUT (C),A
LD L,FREQ Z
DJNZ LOOP
RET
```

Place this routine at around 60000 in the memory and use the following:

```
10 REM TWIN-SOUND DEMO
20 REM c 1985 THE SHIRE
30 CLEAR 59999: LOAD "" CODE
40 FOR N = 0 TO 5
50 READ DUR:READ FREQA:
   READ FREQB
60 POKE 60007, DUR
65 POKE 60018, FREQA
70 POKE 60027, FREQB
80 RANDOMIZE USR 60000
90 NEXT N
100 DATA 200,205,206
110 DATA 70,230,231
120 DATA 255,254,255
130 DATA 255,205,206
140 DATA 255,170,171
150 DATA 255,125,126
```

You will notice that if FREQB is only one higher or lower than FREQA then the noise (sorry! note) caused will seem louder than the average Beep. If you were to write a three-channel routine, which is infinitely harder because registers only come in pairs, you would find the volume even higher.

Craig Rawston.

STORING M/C

■ **I am planning to write a game in Basic with machine-code routines. What I would like to know is, where can I store the machine-code routines?**

ALTHOUGH BBC Basic is very fast, one way of giving that extra "gloss" to games is to use machine-code routines for the most time critical points. Because of the small memory capacity, it is very important to choose the area of memory for the code carefully.

There are several ways to reserve memory for code but the most obvious way is to use the Dim statement. For example:

```
DIM code 100
```

would reserve 100 bytes, the start address being assigned to variable 'code'. Another technique is to store the code between video ram and the basic program. To do this, the size of the object code must first be estimated, say &100 bytes. Then the value of Himem must be lowered by that amount, ie:

```
HIMEM = HIMEM – &100
```

Now the machine code can be assembled from Mimem (the new value) onwards.

For small machine-code routines, it might be convenient to place them in parts of memory below Basic. The choice depends on your Basic program but here are a few guidelines.

900-9FF A safe area so long as you are not using the commands Opening and Openout on tape.
AOO-AFF This part of memory is normally used as cassette workspace and may be used on disc based machines.
BOO-BFF Function key definitions. Use this area of memory if function keys are not being used.
COO-CFF User defined character definitions. This part of memory may be used if user defined characters are not being used.
DOO-DFF User defined character definitions. This part of memory may be used if user defined characters are not being used.
DOO-DFF Used by NMI routines. Usually safe for tape based machines.

SOFTWARE *File*

Programs for Software File should be fairly compact and sent on a cassette. Please include clear instructions and say what computer it's for. We pay between £6 and £36 for programs published. They must be double-checked and submitted

Patch On

M K Mostowyj, Peterborough.

Amstrad

ANYONE WHO owns a DMP1 Printer should already know that the character matrix used is only 5 by 7. Whilst the printout is reasonably good, it could be improved by using a larger character matrix. This program does just that. It works by inserting a patch in the appropriate jump block to redirect the printer routine to a new one in memory.

The new routine provides the DMP1 with a matrix of 8 by 7 with a maximum width of 60 characters in normal mode and 30 characters when printing double width. Although the width is reduced the clarity is increased considerably, and this ability to redefine the complete printer character set is included. Also the # and £ symbols can be mied without the need to alter the Dip switches on the printer.

When the routine is in memory and has been called two RSX commands are logged on. These are:

:PATCHON to turn on the routine
:PATCHOFF to turn it off

All RSX commands must be preceeded with the : symbol. Shifted @?;

First of all type in listing one, and save it before running in case of any errors you may make. When this is run, if all is well, you will be given the opportunity to save the resultant code to tape.

Once this is done you can reload it any time with: MEMORY 41659:LOAD"PATCH":CALL 41660

This can either be a direct command or a line within your basic program.

Now enter listing two and save it on a separate tape. When this program is run you will be asked for the name of the character set you wish to load. The original is saved as patch. Once you have loaded the set various options are open to you.

Menu 1.

N	—	New Character. If pressed the prompt enter character is issued. Enter any Character from the keyboard and press enter. Menu 2 is Then displayed.
S	—	Save driver and code. Saves Character set and driver complete with any Alterations you may have made. A Library of different set can be compiled.

Menu 2.

ARROWS	—	Moves cursor around grid.
COPY	—	Sets/resets bit Occupied by curso.
ENTER	—	Large enter key stores character as defined in grid.
C	—	Clear grid.
I	—	Inverse character.
Q	—	Quits character Without Storing it and returns to menu 1.

```
>10 MODE 1
20 MEMORY 41659
30 sum=0:RESTORE 130
40 PRINT"PLEASE WAIT!!"
50 FOR n=41660 TO 41660+950
60 READ a$:POKE n,VAL("&"+a$)
70 sum=sum+VAL("&"+a$)
80 NEXT
90 IF sum<>60007 THEN CLS:PRINT"ERROR IN DATA!!!!":END
100 CLS:PRINT"Insert tape to save bytes"
110 SAVE "PATCH",b,41660,951
120 END
130 DATA 01,C9,A2,21,C5,A2,C3,D1,BC,00,00,00,00,D1,A2,
C3,E1,A2,C3,F3,A2,50
140 DATA 41,54,43,48,4F,CE,50,41,54,43,48,4F,46,C6,00,
2A,F2,BD,22,69,A3,21
150 DATA FF,A2,22,F2,BD,3E,3C,32,24,AC,C9,2A,69,A3,22,
F2,BD,3E,50,32,24,AC
160 DATA C9,E5,D5,FE,0E,20,17,3A,24,AC,CB,3F,32,24,AC,
3E,02,32,57,A3,17,17
170 DATA 17,32,4F,A3,AF,C3,66,A3,FE,0F,20,0C,3A,24,AC,
CB,27,32,24,AC,3E,01
180 DATA 18,E3,FE,20,38,36,FE,A3,20,02,3E,80,21,6B,A2,
47,11,08,00,19,10,FD
190 DATA 3E,1B,CD,68,A3,3E,4B,CD,68,A3,AF,CD,68,A3,3E,
08,CD,68,A3,06,08,C5
200 DATA 06,01,C5,7E,CD,68,A3,C1,10,F8,23,C1,10,F1,3E,
0F,D1,E1,C3,00,00,00
210 DATA 00,00,00,00,00,00,00,00,00,00,5F,5F,00,00,00,
00,07,07,00,07,07,00
220 DATA 00,14,7F,7F,14,7F,7F,14,00,00,24,2A,7F,7F,2A,
12,00,46,66,30,18,0C
230 DATA 66,62,00,30,7A,4F,5D,37,7A,48,00,00,00,04,07,
03,00,00,00,00,00,1C
240 DATA 3E,63,41,00,00,00,00,41,63,3E,1C,00,00,08,2A,
3E,1C,1C,3E,2A,08,00
250 DATA 08,08,3E,3E,08,08,00,00,00,40,70,30,00,00,00,
00,08,08,08,08,08,08
260 DATA 00,00,00,00,60,60,00,00,00,60,30,18,0C,06,03,
01,00,3E,7F,51,49,45
270 DATA 7F,3E,00,00,40,42,7F,7F,40,40,00,00,72,7B,49,
49,6F,66,00,00,22,63
280 DATA 49,49,7F,36,00,18,1C,16,53,7F,7F,50,00,00,2F,
6F,49,49,79,33,00,00
290 DATA 3E,7F,49,49,7B,32,00,00,03,03,71,79,0F,07,00,
00,36,7F,49,49,7F,36
300 DATA 00,00,26,6F,49,49,7F,3E,00,00,00,00,6C,6C,00,
00,00,00,00,40,6C,2C
310 DATA 00,00,00,00,08,1C,36,63,41,00,00,00,24,24,24,
24,24,24,00,00,41,63
320 DATA 36,1C,08,00,00,00,06,07,51,59,0F,06,00,3E,7F,
41,5D,5D,5F,1E,00,00
330 DATA 7C,7E,13,13,7E,7C,00,41,7F,7F,49,49,7F,36,00,
1C,3E,63,41,41,63,22
340 DATA 00,41,7F,7F,41,63,3E,1C,00,41,7F,7F,49,5D,41,
63,00,41,7F,7F,49,1D
350 DATA 01,03,00,1C,3E,63,41,51,73,72,00,00,7F,7F,08,
08,7F,7F,00,00,41,41
360 DATA 7F,7F,41,41,00,30,70,40,41,7F,3F,01,00,41,7F,
7F,08,1C,77,63,00,41
370 DATA 7F,7F,41,40,60,70,00,7F,7F,0E,1C,0E,7F,7F,00,
7F,7F,06,0C,18,7F,7F
380 DATA 00,1C,3E,63,41,63,3E,1C,00,41,7F,7F,49,09,0F,
06,00,3C,7E,43,51,33
390 DATA 6E,5C,00,41,7F,7F,09,19,7F,66,00,00,26,6F,49,
49,7B,32,00,00,03,41
400 DATA 7F,7F,41,03,00,00,3F,7F,40,40,7F,3F,00,00,1F,
3F,60,60,3F,1F,00,7F
410 DATA 7F,30,18,30,7F,7F,00,61,73,1E,0C,1E,73,61,00,
00,07,4F,78,78,4F,07
420 DATA 00,47,63,71,59,4D,67,73,00,00,00,7F,7F,41,41,
00,00,01,03,06,0C,18
430 DATA 30,60,00,00,00,41,41,7F,7F,00,00,00,04,06,7F,
7F,06,04,00,40,40,40
440 DATA 40,40,40,40,40,00,00,01,03,06,04,00,00,20,74,
54,54,3C,78,40,00,41
450 DATA 7F,3F,44,44,7C,38,00,00,38,7C,44,44,6C,28,00,
38,7C,44,45,3F,7F,40
460 DATA 00,00,38,7C,54,54,5C,18,00,00,48,7E,7F,49,03,
02,00,00,4C,5E,52,52
470 DATA 7E,3E,00,41,7F,7F,08,04,7C,78,00,00,00,44,7D,
7D,40,00,00,00,20,60
480 DATA 40,44,7D,3D,00,41,7F,7F,10,38,6C,44,00,00,00,
41,7F,7F,40,00,00,78
490 DATA 7C,0C,38,0C,7C,78,00,04,7C,78,04,04,7C,78,00,
00,38,7C,44,44,7C,38
500 DATA 00,42,7E,7C,52,12,1E,0C,00,0C,1E,12,52,7C,7E,
42,00,44,7C,78,4C,04
510 DATA 0C,08,00,00,48,5C,54,54,74,20,00,00,04,3F,7F,
44,64,20,00,00,3C,7C
520 DATA 40,40,7C,7C,00,00,1C,3C,60,60,3C,1C,00,3C,7C,
60,38,60,7C,3C,00,44
530 DATA 6C,38,10,38,6C,44,00,00,4E,5E,50,50,7E,7E,00,
00,4C,64,74,5C,4C,64
540 DATA 00,00,08,08,3E,77,41,41,00,00,00,00,77,77,00,
00,00,00,41,41,77,3E
550 DATA 08,08,00,02,03,01,03,02,03,01,00,55,55,2A,2A,
55,55,2A,2A,48,7E,7F
560 DATA 49,49,63,62,00
```

Rotate 'N' Roll

Dave Millen
Welwyn Garden City,
Hertfordshire.

Spectrum

ROTATE 'N' ROLL is an intriguing program for any Spectrum written in Basic, which enables the operator to produce three-dimensional wire frame images of prisms or polyhedrons. The number of sides is optional as is the size of the drawing. The shapes can be shown as a series of single frame movements or can be superimposed to create patterns. Apart from the fascination of the patterns produced, the program can be a valuable aid to secondary school teachers of technical graphics to help pupils to visualise objects in movement.

The rotate facility turns clockwise around a vertical axis and the roll turns the object clockwise around a horizontal axis. The size increase give the impression of movement towards the viewer. A combination of superimposed images using all three facilities simulates a solid moving in space, showing the loci of the sides for specified movements.

The program can be paused at any stage of drawing by holding down M. To continue or abort the drawing, follow the instructions on the screen.

Watching the Demo mode will give the operator an idea of what can be achieved. In Run mode the operator is required to program in his/her instructions. Here is a brief explanation of each input in turn. Each input must be terminated with Enter. Mistakes can be rectified by pressing Caps Shift and Delete.

Polyhedrom — a 3D shape with a flat base, number of sides optional, and lines from each corner joining in a point. Example: pyramid.

Prism — a 3D shape with a flat base and top, number of sides optional. Lines from each corner join the base and top. Example: Cube.

Enter number of sides — This is self-explanatory.

Enter Size-(0-140) — Each unit represents one pixel on the vertical axis at 0 rotation and roll. 140 units is the maximum size, otherwise the program will stop drawing with the message "figures too big" when the roll approaches 45.

Enter initial rotation — To establish the starting position of the object in degrees. 0 degrees rotation gives a side view with a flat face towards the viewer. 45 deg. rotation of a cube would give a corner towards the viewer.

Enter initial roll — Again establishing the starting position of the object in degrees. 0 degrees rotation gives a side view of the object with the face towards the viewer determined by the rotation. The top of the object rolls towards the viewer. 90 deg. roll will give a top view of the object.

Repeat (Y/N) — If the viewer wishes just a drawing of the object already entered then N should be entered. If a sequence of drawings is required then enter Y.

How many! — Number of drawings required in the sequence.

Enter size inc/dec — To increase or decrease the size of the object during a sequence. To avoid exceeding the maximum size the initial size should be subtracted from 140 and the result divided by the number of repeats previously entered.

When decreasing in size, enter a minus number in response to the prompt. If the size reaches 0 before and end of the sequence it will continue but start increasing in size.

Enter rotation increase — The number of degrees by which the object must rotate each time, in a sequence. 360 deg. gives a complete rotation and would give no change. A minus number causes the object to rotate anticlockwise.

Enter roll increase — The number of degrees by which the object must roll towards the viewer each time, in a sequence. 360 deg. gives a complete roll. A minus number causes the object to roll away from the viewer.

Superimpose? (Y/N) — If drawings are required as separate images one after another then enter N. To overlay each successive drawing onto the previous drawings, in the sequence, enter Y.

Enter paper colour — Use keys 0 to 7 to enter your desired paper colour.

Enter ink colour — Use keys 0 to 7 to enter your desired ink colour.

The program will now proceed to follow the instructions entered. Details of each drawing are printed on the left of the screen display. Rotate 'n' roll is very easy to use and provides endless fascination for young and old alike.

For those who do not like typing in listings, I can supply copies on cassette for £3, including postage and packing. Send a cheque or postal order to Dave Millen, 28, Well Garth, Welwyn Garden City, Herts, AL 3AX.

```
   5 GO SUB 8000
  10 GO SUB 5000
  20 GO SUB 6000
  30 IF a3=1 THEN GO TO 4000
2000 FOR v=1 TO d+1
2002 LET j=172
2004 LET j1=j
2006 LET m=b
2010 LET k=88+a/1.4*COS (c*PI/18
0)
2015 LET k1=k
2020 FOR i=1 TO 2
2025 LET x=j+a*SIN (m*PI/180): L
ET y=k+a*COS (m*PI/180)*SIN (c*P
I/180): IF y>175 OR y<0 THEN GO
TO 7000
2026 PLOT x,y: LET xx=x: LET yy=
y
2030 FOR m=b TO b+365 STEP o
2090 LET x=j+a*SIN (m*PI/180): L
ET y=k+a*COS (m*PI/180)*SIN (c*P
I/180): IF y>175 OR y<0 THEN GO
TO 7000
2092 DRAW x-xx,y-yy: LET xx=x: L
ET yy=y
2140 NEXT m
2150 LET k=88+a/1.4*COS ((c+180)
*PI/180)
2160 NEXT i
2170 LET x=j+a*SIN (m*PI/180): L
ET y=k+a*COS (m*PI/180)*SIN (c*P
I/180): PLOT x,y: LET xx=x: LET
yy=y
2180 FOR m=b TO b+365 STEP o
2190 LET x=j+a*SIN (m*PI/180): L
ET y=k+a*COS (m*PI/180)*SIN (c*P
I/180): PLOT x,y
2200 LET xx=j1+a*SIN (m*PI/180):
 LET yy=k1+a*COS (m*PI/180)*SIN
(c*PI/180): DRAW xx-x,yy-y
2230 NEXT m
2240 IF d$="1" THEN GO TO 2310
2300 IF t$="n" OR t$="N" AND r$=
"n" OR r$="N" THEN GO SUB 9000:
GO TO 10
2310 IF t$="n" OR t$="N" THEN GO
 TO 2370
2320 IF INKEY$="M" OR INKEY$="m"
 THEN GO SUB 9000
2325 IF v=d+1 THEN GO TO 2360
2330 IF r$="n" OR r$="N" THEN CL
S
2335 LET a=a+a1/2: IF a>70 THEN
GO TO 7000
2340 LET b=b+b1: IF b>360 THEN L
ET b=b-360
2350 LET c=c+c1: IF c>360 THEN L
ET c=c-360
2355 GO SUB 6000
2360 NEXT v
2370 IF d$="1" THEN RETURN
2380 GO SUB 9000
2385 CLS
2390 GO TO 10
4000 FOR v=1 TO d+1
4002 LET j=172
4004 LET j1=j
4006 LET m=b
4010 LET k=88+a/1.4*COS ((c+180)
*PI/180)
4015 LET k1=k
4020 LET x=j+a*SIN (m*PI/180): L
ET y=k+a*COS (m*PI/180)*SIN (c*P
I/180): IF y>175 OR y<0 THEN GO
TO 7000
4025 PLOT x,y: LET xx=x: LET yy=
y
4030 FOR m=b TO b+365 STEP o
4090 LET x=j+a*SIN (m*PI/180): L
ET y=k+a*COS (m*PI/180)*SIN (c*P
I/180): IF y>175 OR y<0 THEN GO
TO 7000
4092 DRAW x-xx,y-yy: LET xx=x: L
ET yy=y
4140 NEXT m
4150 LET j=172
4160 LET k=88+a/1.4*COS (c*PI/18
0)
4170 FOR m=b TO b+365 STEP o
4190 LET x=j1+a*SIN (m*PI/180):
LET y=k1+a*COS (m*PI/180)*SIN (c
*PI/180): PLOT x,y: DRAW j-x,k-y
4200 NEXT m
4210 GO TO 2300
4999 STOP
5000 INK 0: PAPER 6: BORDER 6: C
LS : INPUT "Polyhedron(1) or Pri
sm(2)? ";a3: IF a3>2 OR a3<1 THE
N GO TO 5000
5002 LET v=0: LET d=1: LET a1=0:
 LET b1=0: LET c1=0: LET r$="n":
 LET t$="n"
5004 DIM c$(8,7): LET c$(1)="Bla
ck": LET c$(2)="Blue": LET c$(3)
="Red": LET c$(4)="Magenta": LET
 c$(5)="Green": LET c$(6)="Cyan"
: LET c$(7)="Yellow": LET c$(8)=
"White"
5005 IF a3=1 THEN PRINT "Polyhed
ron."
5007 IF a3=2 THEN PRINT "Prism."
5010 INPUT ;"Enter No. of sides.
 ";h: PRINT "Sides............";h
: LET bb=(INT (h/2)=h/2)
5020 LET o=360/h
5030 INPUT "Enter size (0-140).
";a: PRINT "Size.............";a:
 LET a=a/2: IF a<-70 OR a>70 THE
N GO TO 5030
5070 INPUT "Enter initial rotati
on.(0-360) ";b: LET b=b+bb*(360
/(h*2)): PRINT "Rotation........
";b-bb*(360/(h*2))
5110 INPUT "Enter initial roll.(
0-360) ";c: PRINT "Roll.........
...";c
5190 INPUT "Repeat?(y/n) "; LINE
 t$: IF t$="n" OR t$="N" THEN GO
 TO 5360
5200 IF t$<>"y" AND t$<>"Y" THEN
 GO TO 5190
5240 INPUT "How many? ";d: PRINT
 "Repeats.........";d: LET v=0
5280 INPUT "Enter size inc/dec.
";a1: PRINT "Size inc/dec....";a
1
5320 INPUT "Enter rotation incre
ase. ";b1: PRINT "Rotation inc..
..";b1
5330 INPUT "Enter roll increase.
 ";c1: PRINT "Roll increase...";
c1
5340 INPUT "Superimpose?(y/n) ";
 LINE r$: IF r$="y" OR r$="Y" TH
EN PRINT "Superimpose": GO TO 53
60
5350 IF r$<>"n" AND r$<>"N" THEN
 GO TO 5340
5360 INPUT "Enter paper colour (
0-7). ";p: IF p<0 OR p>7 THEN GO
 TO 5360: BRIGHT (p=0)
5370 PRINT "Paper..............";c$
(p+1)
5375 INPUT "Enter ink colour (0-
7). ";q: IF q<0 OR q>7 THEN GO T
O 5375
5376 PRINT "Ink...............";c$
(q+1)
5378 FOR l=1 TO 100: NEXT l
5380 BORDER p: PAPER p: INK q: C
LS
5390 RETURN
6000 IF a3=2 THEN PRINT AT 0,0;
INK 9;"Prism."
6010 IF a3=1 THEN PRINT AT 0,0;
INK 9;"Polyhedron."
6020 PRINT AT 2,0; INK 9;"Sides=
";h;AT 4,0;"Size =";a*2;"  ";AT
6,0;"Rot. =";b-bb*(360/(h*2))-(3
60 AND b+bb*(360/(h*2))>360);"
";AT 8,0;"Roll =";c;"  ";AT 10,0
;"Moves=";v
6025 PRINT #1;AT 1,0;"
"M" Pause
6030 RETURN
7000 PRINT #1;AT 0,8; FLASH 1;"F
IGURE TOO BIG"
7010 GO SUB 9000
7020 GO TO 10
8010 BORDER 1: PAPER 1: INK 2: C
LS
```

(continued on next page)

(continued from previous page)

```
8020 PRINT AT 1,1;"■■■■■■■■■■■■■■■■■■■■■■■■";AT 2,11;"■ ■";AT 1,26; INK 7;"■";AT 2,25;"■■■"; INK 2;AT 3,1;"■■■■■■■■■■■"; INK 7;"■■■■"
8030 INK 2: PRINT AT 4,1;"■ ■ ■ ■ ■ ■ "; INK 7;"■ ■■■"
8040 PRINT AT 5,1;"■■■■ ■ ■ ■ ■■■■■■■"; INK 7;"■■■■"
8050 PRINT AT 6,1;"■ ■ ■ "; INK 7;"■■■■■■■■"
8060 PRINT AT 7,1;"■ ■ ■■■■"; INK 7;"■■■■■■"
8070 PRINT AT 8,22; INK 7;"■ ■■ ■"
8080 PRINT AT 9,4; INK 6;"■■■"; INK 2;"■ ■ ■ ■"; INK 7;AT 9,22;"■ ■ ■"
8090 PRINT AT 10,3; INK 6;"■■■■";AT 10,12; INK 2;"■■■ ■";AT 10,22; INK 7;"■ ■ ■"
8100 PRINT AT 11,2; INK 6;"■■■"; INK 0; PAPER 7;"BY"; INK 6; PAPER 1;"■■■";AT 11,14; INK 2;"■ ■■";AT 11,23; INK 7;"■ ■ ■"
8110 PRINT AT 12,1; INK 6;"■■■■■■■■■"; INK 2;AT 12,14;"■ ■■";AT 12,24; INK 7;"■ ■ ■"
8120 PRINT AT 13,1; INK 6;"■■■"; INK 0; PAPER 7;"DAVE"; INK 6; PAPER 1;"■■■"; INK 2;AT 13,14;"■■";AT 13,25; INK 7;"■■■"
8130 PRINT AT 14,1; INK 6;"■■"; INK 0; PAPER 7;"MILLEN"; INK 6;"■■";AT 14,26; INK 7; PAPER 1;"■"
8140 PRINT AT 15,1; INK 6;"■■■■■■■■■"; INK 2;"■■ ■■ ■■■"
8150 PRINT AT 16,2; INK 6;"■■"; INK 0; PAPER 7;"1985"; INK 6; PAPER 1;"■■ "; INK 2;"■ ■ ■ ■ ■ ■"
8160 PRINT AT 17,3; INK 6;"■■■■■ "; INK 2;"■■■ ■ ■ ■■■"
8170 PRINT AT 18,4; INK 6;"■■■■"; INK 2;AT 18,12;"■ ■■ ■ ■■ ■"
8180 PRINT AT 19,12;"■ ■ ■■■ ■■■■■■"
8190 PRINT AT 21,3; INK 1; PAPER 7; FLASH 1;"PRESS ANY KEY TO CONTINUE"
8200 PAUSE 0
8205 LET bb=1
8210 LET u=0: LET d=1: LET a1=0: LET b1=0: LET c1=0: LET r$="n": LET t$="n"
8220 GO SUB 9999
8225 IF INKEY$<>"" THEN GO TO 8225
8230 PRINT AT 10,10;"1:Demo Mode.";AT 12,10;"2:Run Mode."
8240 LET d$=INKEY$: IF d$="" THEN GO TO 8240
8250 IF d$="2" THEN GO SUB 9999: RETURN
8260 LET a3=2: LET h=4: LET o=bb+(360/h): LET a=70: LET b=45: LET c=45: LET d=5: LET t$="y": LET r$="N": LET a1=0: LET b1=10: LET c1=10
8265 GO SUB 9999
8270 GO SUB 20
8280 LET a3=1: LET h=6: LET o=bb+(360/h): LET a=70: LET b=30: LET c=0: LET d=20: LET t$="y": LET r$="y": LET a1=0: LET b1=5: LET c1=8
8290 GO SUB 9999
8300 GO SUB 20
8310 LET d$="2"
8320 GO SUB 9000
8998 GO TO 8210
8999 STOP
9000 IF d$="1" THEN GO TO 9999
9005 PRINT #1;AT 1,0;""C":Continue           "A":Abort": IF INKEY$<>"" THEN GO TO 9000
9010 LET i$=INKEY$: IF i$="" THEN GO TO 9010
9015 IF i$="A" OR i$="a" THEN LET u=d+1: GO TO 9030
9020 IF i$<>"C" AND i$<>"c" THEN GO TO 9010
9025 IF u<>d+1 THEN RETURN
9030 CLS : RETURN
9999 BORDER 6: PAPER 6: INK 0: CLS : RETURN
```

Short Circuit

David Green,
Ashford,
Kent.

ZX-81

BASED ON one of the more memorable scenes from the film whose title was apparently pronounced *Tron*, this game is in fact a vastly improved version of the all-time classic in which a bunch of lines chase each other around for no very good reason. What makes this one different is that it uses a huge 10K playing area, of which only a small part can be seen through your constantly-scrolling window, allowing you to do battle against a maximum of nine computer-controlled pseudo-intelligent opponents. Given the limitations of the machine, it's a great game.

Typing the program in is not particularly difficult, just time-consuming and boring. I suggest you do it in the following stages.

1. Type in the Rem creator program in listing 1, and run it. Then edit line 1 as instructed, press Newline and then use the two commands POKE 16510,0 and POKE 16513,234 to make it into a REM statement that thinks that it is over 1870 bytes long. Check this as PEEK 18394 should be 28.

2. Do not get rid of line 0, and then type in the hexloader from listing 2. Use this to painstakingly thump in the machine code from listing 3.

3. Delete the hexloader, but not line 0, and type in the screen data loader in listing 4 and run this.

4. Type in the Basic program from listing 5 after the line O REM, which should still be there. Please remember to save this before running, but then you can enjoy the game.

I shouldn't need to explain the obvious tactical topology of the game, but if you get completely lost, your opponents always start in around the top-left corner of the arena. Something you may be unfamiliar with is the "short circuit" of the title, which means that when a tracer is destroyed, most of its trail conveniently disappears as well. If you'd like to change the level of difficulty, location 17068 holds the start speed — normally 10 — and location 17073 holds the starting number of opponents, up to a maximum of nine.

Finally, thanks to Stephen Blackford for his occasionally constructive criticism.

Listing 1. Rem creator.

```
   1 PRINT 000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
000000000000
  10 IF PEEK 16993<>28 THEN PRINT "LINE 1 TOO SHORT";X
  20 FOR N=16515 TO 16991 STEP 2
  30 POKE N,21
  40 NEXT N
  50 REM NOW EDIT LINE 1,PRESS NEWLINE,AND THEN
               POKE 16510,0
               POKE 16513,234
```

Listing 2. Hex loader.

```
  10 PRINT "START:"
  20 INPUT S
  30 PRINT "FINISH:"
  40 INPUT F
  50 FOR N=S TO F STEP 8
  60 LET T=0
  65 SCROLL
  70 PRINT N;" - ";
  80 INPUT A$
  90 PRINT A$;" = ";
 100 INPUT TOT
 110 PRINT TOT
 120 LET Z=0
 130 FOR K=1 TO LEN A$ STEP 2
 140 LET C=(CODE A$(K)-28)*16+CODE A$(K+1)-28
 150 LET T=T+C
 160 POKE N+Z,C
 170 LET Z=Z+1
 180 NEXT K
 190 IF TOT=T THEN GOTO 220
 195 SCROLL
 200 PRINT "HUMAN ERROR,RE-ENTER LAST LINE"
 210 GOTO 60
 220 NEXT N
 230 SCROLL
 240 PRINT "** FINISHED **"
```

Listing 3. Machine code.

```
16550 : E5D5C511F203AFED = 1313
16558 : 52E52A0C40112300 = 481
16566 : 19EBE10615C50115 = 731
16574 : 00EDB0014F0009E5 = 731
16582 : 210C0019EBE1C110 = 739
16590 : ECC1D1E1C9061EE5 = 1329
16598 : 2A0C4011FA0219E5 = 641
16606 : 2BEBE1C5011D00ED = 967
16614 : B0C1E17E12231100 = 790
16622 : 02187AB320FB10DF = 852
16630 : C92A044001E803E5 = 776
16638 : D1133600EDB01650 = 925
16646 : 1E01060A36002310 = 280
16654 : FB7BFE0928190E06 = 724
16662 : 0605360023310FB36 = 424
16670 : 08230D20F3060836 = 399
16678 : 002310FB1C180906 = 369
16686 : 5036082310FB1E01 = 475
16694 : 060A36802310FB15 = 521
16702 : C20841E5D1133600 = 906
16710 : 01E803EDB0C9E5D5 = 1292
16718 : 2A0C40112601197E = 325
16726 : 3CFE2820053610C28 = 514
16734 : 18F577D1E1C9E522 = 1286
16742 : 4240224440224640 = 464
16750 : 224840AF324A4032 = 583
16758 : 4B40324C40324D40 = 520
16766 : 060A2A42403A4A40 = 384
16774 : 771198FF197E324A = 821
16782 : 4022424036072A44 = 399
16790 : 403A4A4077131319 = 443
16798 : 7E324B4022444036 = 535
16806 : 042A46403A4C4077 = 625
16814 : 1165001197E324C40 = 459
16822 : 224640360 12A4840 = 529
16830 : 3A4D4077181B197E = 523
16838 : 324D402248403602 = 545
16846 : 2A7B40CDA640C501 = 862
16854 : 0002087B8120F83A = 635
16862 : 0C40112200191108 = 180
16870 : 00061523 7EFE0520 = 607
16878 : 051910F71605C600 = 646
16886 : 7718F0C105C28041 = 968
16894 : 214A40225640214 2 = 454
16902 : 400604 5E23562 3E5 = 553
16910 : 2A56407E12232256 = 491
16918 : 40E110EFE1C9E511 = 1216
16926 : 0100197EE1FE0620 = 805
16934 : 19E511FFFF197EE1 = 1157
16942 : FE86200EE5116400 = 786
16950 : 197EE1FE86280311 = 824
16958 : 9CFF3600197EFE86 = 1004
16966 : 28F8AFED5278FE64 = 1259
16974 : 2809FE9C28051164 = 621
16982 : 0018031101001 97E = 196
16990 : FE86280EAFED52E5 = 1373
16998 : 210000AFED52EBE1 = 987
17006 : 197EFE86C018C821 = 991
17014 : E25C0E08E5065011 = 672
17022 : 64007EB720023608 = 505
17030 : 1910F7E111090019 = 564
17038 : 0D20E921FA5F0E08 = 678
17046 : E506507EB7200236 = 712
17054 : 082310F7E1118403 = 683
17062 : 190D20ECC93E0A32 = 629
17070 : 21403E01323C40CD = 539
17078 : 2A0A2A0C40233607 = 266
17086 : 061523360310F823 = 421
17094 : 3684061511080019 = 266
17102 : 3605111600193685 = 310
17110 : 10F2110800193682 = 495
17118 : 061523368310FB23 = 549
17126 : 3681193692081E23 = 479
17134 : 361810FB23369321 = 617
17142 : 4847060000 40E1723 = 226
17150 : 7EFE17CA1543FE1A = 973
17158 : 28F2E5C8F5CDF500 = 1411
17166 : F177C1E10C18E82A = 1088
17174 : 104023 2323CDD340 = 665
17182 : CDF740215D6CCDA6 = 1121
17190 : 402197467EB7CA64 = 929
17198 : 434F235E2356E52A = 667
17206 : 0C4019224A40E123 = 533
17214 : 46235E2356E52A4A = 665
17222 : 4036801910FB224A = 646
17230 : 400020EA11002016 = 419
17238 : 7AB320FB215D6CCD = 1023
17246 : A640E12318C8CDF7 = 1164
17254 : 402A0C4011EC0119 = 461
17262 : 3A3C40C61C771141 = 609
17270 : 0019060436252310 = 177
17278 : FB215D6C22784021 = 739
17286 : FFFF224040D61C47 = 985
17294 : 2182401 10E8E7323 = 502
17302 : 7223360123360023 = 328
17310 : E52184031 9EBE110 = 898
17318 : ED2A104011210019 = 434
17326 : CDD3402A344 07CE6 = 992
17334 : 0F67225640 3A3C40 = 484
17342 : 47218240C3044478 = 688
17350 : FE642809FE9C2805 = 858
17358 : 1164001803110100 = 162
17366 : CD9544CB472009E5 = 966
17374 : 210000AFED52EBE1 = 987
17382 : E5197EE187C8FE06 = 1250
17390 : C8E5210000AFED52 = 956
17398 : EBE1E5197EE187C8 = 1448
17406 : FE86C81E00C9C5E6 = 1119
17414 : 5E2356234E23467A = 555
17422 : B7287 3EBC5D13686 = 1167
17430 : CD9544E6FFFE0120 = 1194
17438 : 0CD5CDC5437B8720 = 1032
17446 : 03D11801C1197EB7 = 764
17454 : 284CFE082848AFED = 902
17462 : 52CDC5437B87203D = 950
17470 : E52A1040113F0019 = 456
17478 : CDD340E1CD6441CD = 1280
17486 : 6146CD7542061 9CD = 791
17494 : 4C4110FB2A0C4011 = 543
17502 : EC01197E3D77FE1C = 850
17510 : 2005C1C1C39F452A = 888
17518 : 104011210019CDD3 = 571
17526 : 401600180919368D = 387
17534 : 000000D5C1EBE173 = 981
17542 : 2372237123 7023C1 = 672
17550 : 05C20444C3A044E5 = 923
17558 : 2A5640237E225640 = 537
17566 : E1C92A7B40ED5B40 = 1047
17574 : 4036063EF7DBFECB = 1109
17582 : 67200311FFFF3EEF = 986
17590 : DBFECB6720031164 = 931
17598 : 00CB5F2003119CFF = 761
```

```
17606 : CB5720031101003E = 405
17614 : FDDBFECB47200311 = 1052
17622 : FFFFCB4F20031164 = 944
17630 : 00CB572003110100 = 343
17638 : 3ED0DBFEFE7F2003 = 1178
17646 : 119CFF3EBFDBFECB = 1357
17654 : 5720031101000CB5F = 438
17662 : 200311FFFF3E7ED8 = 969
17670 : FEFE7F2003116400 = 795
17678 : 197EB7200AFE0828 = 686
17686 : 06AFED52C3294636 = 660
17694 : BDCDA640ED534040 = 1072
17702 : 2278402A0C401130 = 404
17710 : 02197E3DFE1B2005 = 532
17718 : 362528180F5770E00 = 536
17726 : 3A21404708780B120 = 566
17734 : FBC3BB432A0C4011 = 835
17742 : 77011922 4C402A4A = 435
17750 : 4028E5AF324E40E1 = 928
17758 : 237EFE632004 2A4A = 666
17766 : 407EE54F2A4C4011 = 697
17774 : DEFF19224C407EFE = 1056
17782 : 072002C1C93A4E40 = 635
17790 : 3C3C324E40472371 = 531
17798 : 10FC112100471971 = 527
17806 : 10FC4728071 10FC11 = 780
17814 : DFFF47197110FC18 = 979
17822 : BE0609C521364722 = 598
17830 : 4A400603C5CD4A45 = 698
17838 : 0100050878B120FB = 597
17846 : 2A4A402323232322 = 354
17854 : 4A40C110E7C110DB = 1006
17862 : 2A1040115D00019CD = 462
17870 : D3402A0C40112E02 = 458
17878 : 197EFE0E281030FE = 790
17886 : 1B200536252B10F1 = 463
17894 : 77CD4C4118E40604 = 727
17902 : 23361C10FB3A3C40 = 566
17910 : 3CFE0A20013D323C = 528
17918 : 403A21403DFE0220 = 568
17926 : 013C322140010000 = 209
17934 : 0B78B120FB2A0C40 = 709
17942 : 11AC01197E3CFE26 = 693
17950 : 2005361C2B18F577 = 550
17958 : C36443E52A104011 = 730
17966 : 7B0019CDD340E1CD = 1058
17974 : 64412A0C40116A01 = 407
17982 : 197E3C7701000640B = 442
17990 : 78B120FB7EFE21C2 = 1187
17998 : 6443060 3C52A1040 = 495
18006 : 11990019CDD340C1 = 868
18014 : 10F2C9E5CD1C42E1 = 1212
18022 : CD1C42C9ED737B40 = 1039
18030 : ED5B7B40210050AF = 851
18038 : ED52444D21E85822 = 851
18046 : 0440AFED4222 7B40 = 767
18054 : EBED802A7B40F9C9 = 1327
18062 : ED737B40ED4B7B40 = 1038
18070 : C9046502 0EDFFF0E = 814
18078 : FFFF0721000E0100 = 565
18086 : 05700010E010007DF = 364
18094 : FF0EFFFFF0E21000E = 840
18102 : 010007DFFF028900 = 625
18110 : 0E01000F21000597 = 219
18118 : 000EFFFF0E21000E = 585
18126 : 010007DFFF0EFFFF = 1010
18134 : 0597000EFFFF0721 = 720
18142 : 000E010007210000F = 70
18150 : FFFF048900072100 = 691
18158 : 0E010007DFFF0F21 = 548
18166 : 00065900 0E010007 = 165
18174 : 21000EFFFF0E0100 = 572
18182 : 0721000FFFFF0589 = 707
18190 : 000E010007210000E = 69
18198 : FFFF0721000F0100 = 566
18206 : 0190000F21000489 = 334
18214 : 000E01000E21000E = 76
18222 : FFFF0EDFFF000000 = 1002
18230 : 003D000800063 0000 = 304
18238 : 0063800000063 0000 = 462
18246 : 0063000000063 8000 = 454
```

Listing 4. Screen data loader.

```
   10 LET A$="SHORT  CIRCUIT
      BY  D.GREEN    SCORE:  00000
66  DEFEATS:0   GRIDS:001   THEM:
0  TIME:0000  [illegible]
   20 FOR N=1 TO LEN A$
   30 POKE 18251+N,CODE A$(N)
   40 NEXT N
```

Listing 5. Basic program.

```
   10 REM >> SHORT CIRCUIT <<
          (C)D.GREEN 1985
   20 CLEAR
   30 LET X$="........READY TO FIG
HT ?...............COMBAT IN PROGR
ESS..............OPPONENT DESTROYE
D.........ALL DESTROYED - KILL BO
NUS..........*** DEFEATED ***.....
...............GAME OVER..........
..."
   40 GOSUB 620
   50 PRINT ,,"[block graphics]"
   60 PRINT ,,"[block graphics]"
   70 PRINT ,,TAB 11;"BY D.GREEN"
   80 PRINT ,,TAB 12;"(C) 1985"
   90 PRINT ,,TAB 9;"HIGH TECH SO
FT"
  100 FOR N=1 TO 150
  110 IF INKEY$<>"" THEN GOTO 350
  120 NEXT N
  130 CLS
  140 PRINT TAB 7;"SHORT  CIRCUIT
";TAB 7;"            ",,,"** W
ELCOME TO THE GAME GRID **"
  150 PRINT ,,"FORCE THE ENEMY LI
GHT TRACERS   TO CRASH INTO THE
JETWALLS."
  160 PRINT ,,"USE KEYS:"
  170 PRINT ,,"            7     U      I
U   I          5 8   A D   J K   J
 K   A D        6     Z     M"
  180 PRINT ,,"(ALL OPTIONS ARE S
IMULTANEOUS)",,
  190 PRINT ,,TAB 3;"""MORITURI T
E SALUTANT""",,
  200 PRINT ,,TAB 2;">PRESS ANY K
EY TO START<",,
  210 FOR N=1 TO 200
  220 IF INKEY$<>"" THEN GOTO 350
  230 NEXT N
  240 CLS
  250 PRINT TAB 5;"* HIGH SCORES
*";TAB 5;"            "
  260 FOR N=1 TO 10
  270 PRINT "*** ";S$(N);" ....";
N$(N);" ***",,
  280 NEXT N
  290 PRINT TAB 2;">PRESS ANY KEY
TO START<"
  300 FOR N=1 TO 200
  310 IF INKEY$<>"" THEN GOTO 350
  320 NEXT N
  330 CLS
  340 GOTO 50
  350 POKE 17532,54
  360 IF USR 18062>30000 THEN LET
X=USR 18026
  370 LET X=USR 17067
  380 FOR N=1 TO 100
  390 NEXT N
  400 LET HL=PEEK 16396+256*PEEK
16397+289
  410 LET A$=""
  420 FOR N=0 TO 6
  430 LET A$=A$+CHR$ PEEK (HL+N)
  440 NEXT N
  450 FOR N=1 TO 10
  460 IF A$>S$(N) THEN GOTO 500
  470 NEXT N
  480 GOTO 240
  500 CLS
  510 POKE 16418,2
  520 PRINT AT 5,4;">>CONGRATULAT
IONS<<",,,,"YOU ARE REQUESTED TO
ENTER YOUR NAME FOR THE GAME GRI
D                 ** HALL OF FAME *
*"
  530 FOR B=10 TO N+1 STEP -1
  540 LET S$(B)=S$(B-1)
  550 LET N$(B)=N$(B-1)
  560 NEXT B
  570 INPUT N$(N)
  580 POKE 16418,0
  590 LET N$(N)=" "+N$(N)( TO 11)
  600 LET S$(N)=A$
  610 GOTO 240
  620 POKE 16418,0
  630 DIM S$(10,7)
  640 DIM N$(10,12)
  650 FOR N=2 TO 10
  660 LET S$(N)="0000000"
  670 LET N$(N)="       ZX-81"
  680 NEXT N
  690 LET S$(1)="0017150"
  700 LET N$(1)="       A.X.E"
  710 RETURN
  720 SAVE "S█"
  730 RUN
  750 REM
               THE END
```

Autodialler

John Derrick,
Cheddar,
Somerset.

CBM-64

I HAVE been using your Telsoft service. I wrote this to take advantage of the auto-dial facility..

The program D3 is entirely machine code and is designed to work with D1 and D2 of the Dialsoft program. To use it load the three programs and type

SYS 49188

and press Return. The program prompts for the number to dial. Type the number, with a minus sign separator if necessary, pressing Delete if you make a mistake. Pressing Return or typing 5 digits, causes the number to be dialed. D3 now passes control to D1 and the program proceeds as normal. The program on tape is a Basic loader for the machine code, so the saver with the dialsoft program used to save D1 and D2 can be used to save D3 to tape or disc.

The D3 program isn't relocatable unless it is re-written, i.e. change the JSR's and some LDA's, but it doesn't matter if the program is overwritten once you are on-line, as it won't be reused.

```
0 PRINT"█ D3 - COMMUNICATIONS PROGRAM"
1 PRINT"█ WRITTEN FOR '█YOUR COMPUTER█'"
2 PRINT"█ BY █DAVID DERRICK█ 1-7-85."
10 TT=0:FORX=49152TO49482:READA:POKEX,A:TT=TT+A:NEXT
20 IFTT<>41165THENPRINT"█DATA ERROR":END
30 PRINT"█TYPE 'SYS 49188' + RETURN TO ACTIVATE"
1000 DATA206,85,77,66,69,82,32,42,196,73
1010 DATA65,76,76,73,78,71,215,65,73,84
1020 DATA73,78,71,32,70,79,82,32,67,65
1030 DATA82,82,73,69,82,162,169,6,141,0
1040 DATA222,169,0,141,1,222,32,243,192,169
1050 DATA6,141,0,222,169,1,141,1,222,32
1060 DATA243,192,169,23,141,24,208,32,68,229
1070 DATA162,2,160,4,24,32,240,255,162,0
1080 DATA189,0,192,32,210,255,232,224,8,208
1090 DATA245,169,0,133,2,169,95,32,210,255
1100 DATA169,157,32,210,255,32,2,193,201,0
1110 DATA240,239,170,201,13,208,3,76,156,192
1120 DATA233,48,48,237,138,233,58,16,232,138
1130 DATA32,210,255,201,48,208,2,162,58,138
1140 DATA164,2,153,64,3,230,2,165,2,201
1150 DATA15,240,3,76,95,192,160,3,162,4
1160 DATA24,32,240,255,160,8,185,0,192,32
1170 DATA210,255,200,192,16,208,245,169,32,32
1180 DATA210,255,160,0,185,64,3,170,224,58
1190 DATA208,2,162,48,138,32,210,255,201,45
1200 DATA208,6,32,243,192,76,232,192,169,8
1210 DATA141,0,222,185,64,3,141,1,222,169
1220 DATA8,141,0,222,185,64,3,205,1,222
1230 DATA240,248,200,196,2,208,203,32,243,192
1240 DATA76,232,7,32,53,193,96,234,234,234
1250 DATA234,234,234,234,234,234,234,234,32,228
1260 DATA255,133,78,201,20,240,11,234,165,78
1270 DATA201,45,240,20,234,165,78,96,165,2
1280 DATA201,0,240,7,169,20,32,210,255,198
1290 DATA2,169,0,96,32,210,255,169,45,164
1300 DATA2,153,64,3,230,2,169,0,96,152
1310 DATA72,138,72,160,0,162,0,202,224,0
1320 DATA208,251,136,192,0,208,244,104,170,104,96
READY.
```

Screen Handler

Steven Meyfroide,
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Manchester.

Enterprise

As YOU will probably have discovered, the screen handling on the Enterprise is very flexible. Like the Atari, previously unequalled for graphics, it has a total of 256 colours, and also like the Atari, different screen modes can be displayed at the same time. For example, say you want a 16 colour hi-res screen for graphics and a small text screen above it for score etc, then just open the appropriate channels and display them wherever you want them:

```
100 set video mode 1 !Hi-res graphics
110 set video colur 2 !16 colours; horizontal res 160
120 set video x 40 !40 chars across
130 set video y 20 !20 chars down
140 open£1: "video:" !Open the hires page
150 set video mode 0 !40 column text
160 set video colour 0 !Two colours
170 set video y 4 !4 chars down
180 open£3:"video:" !Open the text page
```

At this stage the pages are not on the screen, so display them

```
190 display£1:at 5 from 1 to 20 !16 colour hires from 5-25
200 display£2:at 1 from 1 to 4 !Text from 1-4
```

Note that the settings for 'videox' etc are not

(continued on next page)

(continued from previous page)

erased by an open, ie they don't have to be defined for every channel if the channels have the same settings for any of them. Hence, in the program above, "video × " is defined once and this setting is used for both pages.

At the top of Ram is a block of memory that the video chip uses to display a screen. this is like a program, telling the chip what mode the next line is to be in etc, but more importantly, it holds a palette for every single line it has to display. If we could change this, we could change the palette for a given line within the same channel ie, Colour 1 could be red on the first line of channel 1, in which case anything drawn in colour one appears as red; and also, colour 1 could be blue on the next line.

The only problem is how to access this block of memory, but luckily, it is quite easy with the Speek and Spoke commands in IS Basic. Firstly, you need to know where the Line Parameter Block is so:

```
A=SPEEK(255,49140)+SPEEK(255,49141)*256).
```

An address will be put into A that is the beginning of the block of memory we want. A will usually be equal to 47872 in Basic. The format of this table is:

Disp Contents
00 Two's complement of scanlines in this modeline.
01 The video display mode for this line
02 See Technical manual
03 See Technical manual.
04 Lo byte of address of screen memory for this modeline.
05 Hi byte of address of screen memory for this modeline.
06 Lo of graphic memory in attribute mode or address of character definitions in text modes.
07 Hi of above.
08-15 Palette definition. (Colours 0-7)

The address of the screen memory (04-05) can be used to Poke the display in Basic or machine code — the format of the screen memory for the various modes is detailed in the Technical Manual. Moreover, the data we want is there at 08-15. All that is needed is a small program to change the palette definition to what we want - here is a simple one. Put the colours wanted for colours 0-7 in the Data statement and run it.

```
5 LET num =5
10 FOR A=47872 TO 47872 + num*16-6 STEP
16
20 FOR B=08 TO 15
30 READ C
40 SPOKE 255,A+B,C
50 NEXT B
60 NEXT A
70 END
100 DATA 15,25,35,45,55,65,75,85,
110 DATA 95,105,115,125,135,145,155,165
120 DATA 175,185,195,20 5,215,225,235,245
130 DATA 49,59,69,79,89,99,109,119
140 DATA 58,46,112,195,237,247,168,249
```

...etc for number of lines wanting to be changed...Just set 'num' to however many lines you want changing. Notice that the first line is the Status Line, and to miss this out change line 10 to:

```
10 FOR A=47872+16 TO 47872+16+...etc..
```

With the knowledge of what is in the Line Parameter Block, I'm sure you can think of many interesting things to do — scrolling is easy, for example: just change the address of the screen memory on every line to equal the address of the line above or below it. Sideways scrolling can also be done but with a bit more difficulty.

One interesting project would be to install a new device driver so that a channel could be opened that simulated say a Spectrum screen (attribute mode is the obvious choice!) or BBC screen(s). The driver would have to be able to interpret control codes sent to it and act on them as the BBC or Spectrum would do.

This wouldn't be too difficult with a knowledge of machine code since the way to install device drivers is outlined in the Technical manual. If a BBC screen was simulated like this (but beware of the different modes, especially teletext — ignore colour control codes), then coversion from BBC Basic to IS Basic would be simple — procedures and functions are defined in similar ways (though the IS versions are more powerful with parameter passing by reference — including other functions and arrays).

You have probably noticed that you can't use FOR...NEXT loops in immediate mode! This can be very useful while editing to test the contents of memory, so to do this, type EDIT 200 to create a work space for program 200 (!) and type your For loop in as a separate program, eg:

```
EDIT 200
10 FOR A=1 TO 10
20 PRINT PEEK (A);
30 NEXT A
```

This can be run and then Newed. Type EDIT 0 or whatever to get to your real problem.

Turboload

R Grzasko,
London SE15.

Vic 20

This utility program will load, save and verify programs six times faster than normal.

First of all type in program one save it then run it. This will move the start of basic above the part of Ram where the Turboload program is located.

Save in case of error

Next type in program two and save it in case of an error. Then run the program.

If all is well after a short time a message will appear on the screen — "You are now ready to Turboload programs". Type:

SYS5120

to activate the Turboload program. The Turboload program will not load programs that have not been saved by the Turboload program, also normal programs will not load with the Turboloader activated.

Press Run Stop and Restore

To overcome this problem press run stop and restore together. You can now load normal programs. Then you can type:

SYS5120

and save your program at turbo speeds.

When programs using the Turboloader are loading the border will turn blue. A more colourful display may be obtained by changing line 2000 to:

2000 DATA90,29,FC,EA,EA,49,04,8D,1123

If you experience load, verify and save problems try using a good quality computer tape.

```
100 PRINT"■■■THE FAST LOAD PROGRAM WILL TAKE A SHORT TIMETO LOAD SO PLEASE WAIT
"
140 S=5120:N=0:AD=0
150 T=0
160 READA$:IFA$="END"THEN480
170 H=ASC(A$)-48:L=ASC(MID$(A$,2))-48
180 V=16*(H+7*(H>9))+L+7*(L>9)
185 T=T+V:AD=AD+V
190 IFRIGHT$(A$,1)="*"THENV=V+INT(S/256)
200 POKES+N,V:N=N+1
210 IFNAND7THEN160
220 READTT:IFTT=TTHEN150
480 READTC:IFTC=ADTHEN500
500 READTN:IFTN=NTHEN520
520 SYS5120
530 PRINT"■YOU ARE NOW READY TO  SAVE OR LOAD PROGRAMS USING THE FAST LOAD"
540 PRINT"WHEN YOU WISH TO LOAD THE NEXT PROGRAM YOU  MUST ■1■ PRESS RUN/STOP"
550 PRINT"RESTORE THEN ■2■ LOAD"
1000 DATAA9,B3,8D,30,03,A9,01*,8D,851
1010 DATA31,03,A9,22,8D,32,03,A9,618
1020 DATA00*,8D,33,03,A2,00,BD,9A,700
1030 DATA01*,F0,06,EA,EA,EA,E8,D0,1389
1040 DATAF5,60,A5,BA,C9,01,F0,03,1137
1050 DATA4C,85,F6,A9,00,85,90,A2,1063
1060 DATA1E,20,AB,F8,F0,07,20,B7,943
1070 DATAF8,B0,E6,A2,B4,86,A5,20,1327
1080 DATA28,F7,A0,00,A5,B9,91,B2,1120
1090 DATAA5,C1,C8,91,B2,48,A5,C2,1312
1100 DATAC8,91,B2,48,A5,AE,C8,91,1279
1110 DATAB2,48,A5,AF,C8,91,B2,48,1185
1120 DATA20,54,F8,A5,B7,A0,05,91,1022
1130 DATAB2,A2,00,A9,20,E4,B7,B0,1128
1140 DATA0C,88,88,88,88,88,B1,BB,1056
1150 DATAC8,C8,C8,C8,C8,C8,91,B2,1523
1160 DATAE8,C0,BF,90,E6,A5,A5,A2,1481
1170 DATAF0,20,A4,00*,68,85,AF,68,952
1180 DATA85,AE,68,85,C2,68,85,C1,1168
1190 DATAB0,07,A9,14,A2,0F,20,A4,745
1200 DATA00*,A9,00,60,85,A5,86,AA,867
1210 DATA20,60,01*,A5,C1,85,C3,A5,990
1220 DATAC2,85,C4,A9,64,8D,16,91,1100
1230 DATAA9,00,8D,15,91,A9,FF,8D,1041
1240 DATA26,91,8D,25,91,A9,FF,8D,1071
1250 DATA25,91,A9,0F,20,28,01*,B0,615
1260 DATA49,AD,2D,91,29,40,F0,F2,1023
1270 DATAAD,24,91,C6,A5,D0,E6,A2,1317
1280 DATA0F,8A,20,28,01*,CA,10,F9,693
1290 DATAA5,AA,20,28,01*,A9,00,85,710
1300 DATABD,A5,C3,C5,AE,D0,06,A5,1299
1310 DATAC4,C5,AF,F0,18,A0,00,B1,1169
1320 DATAC3,48,20,28,01*,68,B0,12,638
1330 DATA65,BD,85,BD,E6,C3,D0,E1,1470
1340 DATAE6,C4,18,90,DC,A5,BD,20,1200
```

```
1350 DATAA28,01*,A5,B4,8D,0F,90,A9,855
1360 DATAA00,8D,A0,02,58,4C,CF,FC,926
1370 DATAAA0,08,0A,48,A9,40,2C,1D,556
1380 DATAA91,F0,FB,90,08,A9,0C,85,1102
1390 DATAABE,C6,BE,D0,FC,A9,00,8D,1348
1400 DATAA15,91,AD,20,91,49,08,8D,738
1410 DATAA20,91,29,08,D0,07,20,59,562
1420 DATAA01*,90,D9,68,60,68,88,D0,1010
1430 DATAAD1,AD,21,91,49,01,4A,60,804
1440 DATAA78,AD,0F,90,85,B4,AD,1C,966
1450 DATAA91,29,FC,8D,1C,91,A9,F7,1168
1460 DATAA8D,20,91,A9,C0,85,C0,A9,1173
1470 DATAA40,8D,1E,91,A9,42,8D,2E,802
1480 DATAA91,A9,00,8D,1B,91,8D,2B,811
1490 DATAA91,8D,15,91,8D,25,91,A2,937
1500 DATAAFF,A0,FF,88,D0,FD,CA,D0,1677
1510 DATAAF8,60,93,11,56,49,43,20,766
1520 DATAA54,55,52,42,4F,20,28,43,535
1530 DATAA29,20,4A,2E,54,57,49,44,505
1540 DATAA44,59,00,85,93,A5,BA,C9,989
1550 DATAA01,F0,03,4C,4B,F5,A9,00,809
1560 DATAA85,90,20,94,F8,A9,00,B0,1050
1570 DATAAD0,20,47,F6,A5,93,85,0A,1012
1580 DATAAA9,00,85,93,A5,C3,48,A5,1046
1590 DATAAC4,48,20,54,F8,A9,F0,20,1073
1600 DATAA81,02*,68,85,C4,68,85,C3,996
1610 DATAAB0,36,24,9D,10,15,A0,63,719
1620 DATAA20,E6,F1,A0,05,B1,B2,AA,1193
1630 DATAAF0,09,C8,B1,B2,20,D2,FF,1301
1640 DATAACA,D0,F7,A9,00,85,9E,A9,1286
1650 DATAA06,85,9F,A4,9E,C4,B7,B0,1175
1660 DATAA0E,B1,BB,A4,9F,D1,B2,D0,1296
1670 DATAABB,E6,9E,E6,9F,D0,EC,18,1432
1680 DATAAA5,0A,85,93,A5,90,F0,03,1007
1690 DATAAA9,18,38,90,01,60,20,6A,628
1700 DATAAF6,A0,00,B1,B2,D0,04,A5,1138
1710 DATAAB9,F0,0A,C8,B1,B2,85,C3,1318
1720 DATAAC8,B1,B2,85,C4,A0,03,B1,1224
1730 DATAAB2,38,A0,01,F1,B2,AA,A0,1144
1740 DATAA04,B1,B2,A0,02,F1,B2,A8,1108
1750 DATAA18,8A,65,C3,85,AE,98,65,1018
1760 DATAAC4,85,AF,A5,C3,85,C1,A5,1355
1770 DATAAC4,85,C2,A9,0F,20,81,02*,870
1780 DATAAA5,90,F0,08,A9,1D,A6,93,1068
1790 DATAAF0,02,A9,1C,A6,AE,A4,AF,1118
1800 DATAA60,85,AA,20,60,01*,A9,0C,709
1810 DATAA8D,16,91,A9,01,8D,15,91,785
1820 DATAAA9,FF,8D,26,91,8D,25,91,1071
1830 DATAAA9,FF,85,A9,20,59,01*,B0,1024
1840 DATAA10,20,43,03*,26,A9,A5,A9,659
1850 DATAAC9,0F,D0,F0,20,33,03*,90,894
1860 DATAA03,4C,FB,02*,C9,0F,F0,F4,1032
1870 DATAAA2,0E,E4,A9,D0,DA,20,33,1082
1880 DATAA03*,CA,10,F6,C5,AA,D0,D0,1250
1890 DATAAA9,00,85,BD,A5,C1,85,C3,1177
1900 DATAAA5,C2,85,C4,A5,C3,C5,AE,1419
1910 DATAAD0,24,A5,C4,C5,AF,D0,1E,1215
1920 DATAA20,33,03*,C5,BD,18,F0,13,755
1930 DATAAA9,20,05,90,85,90,A5,AA,962
1940 DATAAC9,F0,D0,06,A9,10,05,90,989
1950 DATAA85,90,38,4C,1A,01*,20,33,519
1960 DATAA03*,B0,F8,A0,00,A6,93,D0,1108
1970 DATAA04,91,C3,F0,0C,D1,C3,F0,1240
1980 DATAA08,AA,A9,10,05,90,85,90,789
1990 DATAA8A,18,65,BD,85,BD,AD,0F,962
2000 DATAA90,29,FC,09,02,49,04,8D,666
2010 DATAA0F,90,E6,C3,D0,A6,E6,C4,1384
2020 DATAA4C,D4,02*,A0,08,20,43,03*,560
2030 DATAA26,A9,88,D0,F8,20,59,01*,921
2040 DATAAA5,A9,60,A9,42,2C,2D,91,899
2050 DATAAF0,FB,AD,1D,91,0A,0A,A9,1027
2060 DATAA01,8D,15,91,A9,FF,8D,25,910
2070 DATAA91,AD,21,91,60,END,109406,861
```

Headerless files

Ian Harris,
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Berkshire.

Spectrum

WHEN YOU USE the ordinary Spectrum Save and Load commands, the computer normally deals with the tape file in two parts. The first is the header which contains information about the start address and the length and name of the file. The secod is the actual block of code to be saved/loaded.

This short machine code program enables the user to bypass the header, and save or load the block of code on its own. This is achieved by typing in one of the two new commands, the format of which is as follows.

To save a headerless file, type:

*SAVE start, length

To load a headerless file, type:

*LOAD start, length

where "start" is the address at which the file is to begin, e.g.: 16384 — the start of the screen — and "length" is the number of bytes that are to be saved/loaded, e.g.: 6912 — the length of a Screen.

Note that the program will not load the actual header of a file; only the code block after it. You can also load a specified amount of a file, e.g.: the first third of a screen picture. To do this, take any screen picture file, and type:

*LOAD 16384, 2048

16384 is the start of the screen; 2048 is the number of bytes in the first third of the screen. The program will stop loading part way through the tape file, i.e., when 2048 bytes have been loaded.

If you don't know the length of a headerless file, just set the length equal to 65535; this will load in everything, no matter what length.

To get the routine up and running, type in listing 1. Save this on a blank tape using:

SAVE "HEADERLESS"LINE 1

Now type New and enter listing 2. Run it, and when there are no errors save the machine code after the loader with:

SAVE "H" CODE 65162,206

The checksum in the listing should detect most errors. Now reset your machine, and Load the whole thin ing. To initialise the routine, type:

RANDOMIZE USR 65356

*Save and *Load should now be accepted. If they are not, or the routine crashes, then there is an error in the machine code.

If for any reason the Spectrum fails to accept the commands but you know that they work correctly; this is probably due to a Clear command or Run command being executed; then just reinitialise the routine using the USR statement as above.

If you wish to use the commands in a program, make sure that:

RANDOMIZE USR 65356

is the first line of your routine.

Loader program.

```
   1 CLEAR 65161: LOAD "H"CODE 6
5162,206: PRINT "Type RANDOMIZE
USR 65356 to""initialise."
```

Hex loader.

```
  10 DEF FN h(h$)=16*(CODE h$(1)
-48-(7 AND h$(1)>"9"))+CODE h$(2
)-48-(7 AND h$(2)>"9")
  19 REM hfdhd
  20 INPUT "Start ";s
  30 INPUT "Finish ";f
  39 REM fd
  40 FOR n=s TO f STEP 8
  50 LET tot=0: PRINT n;": ";
  60 INPUT h$: PRINT h$;
  70 LET x=0
  80 FOR b=1 TO LEN h$ STEP 2
  90 LET z=FN h(h$): LET tot=tot
+z
 100 POKE n+x,z
 110 LET h$=h$(3 TO ): LET x=x+1
 120 NEXT b
 130 PRINT " = ";: INPUT t: PRIN
T t
 140 IF tot<>t THEN PRINT "input
 error - try again": GO TO 50
 150 NEXT n
 160 REM enter STOP to stop
```

Hex dump.

```
65162:  3A3A5CFE082823FD  =  801
65170:  CB017E20082AB25C  =  682
65178:  23E5C3B712CD0313  =  887
65186:  FD3600FF2A595CCD  =  990
65194:  A7112AB25C23E5C3  =  955
65202:  B4122A5D5C2B7EFE  =  848
65210:  2A20D4DFFE532815  =  907
65218:  FE4C20C8E7FE4F20  = 1161
65226:  C6E7FE4120C1E7FE  = 1458
65234:  44208C180FE7FE41  =  877
65242:  2085E7FE5620B0E7  = 1223
65250:  FE4520A832815CE7  = 1028
65258:  FE2028FBFD3600FF  = 1139
65266:  FD362600CD7A1CFD  =  953
65274:  CB007E2292FE0D28  =  822
65282:  04FE3A205AFD3600  =  793
```

(continued on next page)

(continued from previous page)

```
65290: FFFDCB017E200C2A = 924
65298: B25C23E52187128E5 = 997
65306: C37618CD991E5059 = 897
65314: D5CD991EED43805C = 1173
65322: DD2AB05CD13A815C = 1019
65330: FE442808 3EFF37CD = 947
65338: C20418083EFF37CD = 805
65346: 56052AB25C23E5C3 = 862
65354: 7618ED58B25C132A = 804
65362: 3D5C732372C9003C = 678
65370: 42 = 66
```

Telecolour

J C Bullock,
Telford,
Shropshire.

BBC

TELECOLOUR MAKES it easier to produce the CHR$ colour commands, by printing the correct CHR$ expression when one of the function keys is pressed with Shift/CTRL for example:

When Telecolour is off, SHIFT + f1 produces a red colour control character.
When Telecolour is on, SHIFT + f1 produces 'CHR$129;'

The program occupies less than 255 bytes in machine code. Type it in, Run it, an type:

*SAVE TELECOL 900 9FF

If you press CTRL and Break or redefine f0 or the Break key, you will have to type in *FX18 followed by the 2 function key definitions given in lines 50 and 60 of the listing. Now, Break will switch Telecolour on, f0 will switch it off.

```
   10 REM********************************
   20 REM*Telecolour (c)1985 J.Bullock*
   30 REM********************************
   40
   50 *K.10 ?&71=?&210:?&72=?&211:?&210=0:?&211=9|M|K|
K|M|HTelecolour switched on.               |J|U|K|M
   60 *K.0 ?&210=&C5:?&211=&DE|M|K|K|M|HTelecolour swi
tched off                  |J|U|K|M
   70 FOR A%=0 TO 2 STEP 2:P%=&900
   80 [OPT A%:STA &70
   90 PHA:PHP:TXA:PHA:TYA:PHA
  100 LDA &70
  110 CMP#144:BCC ALPHA
  120 CMP#154:BCS NOCODE
  130 PHA:JSR chr:PLA
  140 CLC:SBC#143
  150 ASL A:TAX:STX &70
  160 LDY graphic,X
  170 LDA#138:LDX#0:JSR &FFF4
  180 INC &70:LDX &70
  190 LDY graphic,X
  200 LDA#138:LDX#0:JSR &FFF4
  210 LDY#59:JSR &FFF4
  220 LDA#1:STA &70:JMP OUT
  230 .ALPHA
  240 CMP#128:BCC NOCODE
  250 CMP#138:BCS NOCODE
  260 PHA:JSR chr:PLA
  270 CLC:SBC#127:ASL A:TAX:STX &70
  280 LDY alpha,X
  290 LDA#138:LDX#0:JSR &FFF4
  300 INC &70:LDX &70
  310 LDY alpha,X
  320 LDA#138:LDX#0:JSR &FFF4
  330 LDY#59:JSR &FFF4
  340 LDA#1:STA &70:JMP OUT
  350 .NOCODE
  360 LDA#0:STA &70
  370 .OUT
  380 PLA:TAY:PLA:TAX:PLP
  390 LDA &70:CMP#1:BEQ VEC
  400 PLA:JMP (&71)
  410 .VEC PLA:LDA#0:JMP (&71)
  420 .chr
  430 LDA#138:LDX#0
  440 LDY#127:JSR &FFF4
  450 LDY#67:JSR &FFF4
  460 LDY#72:JSR &FFF4
  470 LDY#82:JSR &FFF4
  480 LDY#36:JSR &FFF4
  490 LDY#49:JSR &FFF4:RTS
  500 .graphic
  510 ]
  520 $P%="56454647484950515354"
  530 P%=P%+LEN $P%:[OPT A%
  540 .alpha
  550 ]
  560 $P%="57293031323334353637"
  570 P%=P%+LEN $P%:[OPT A%:]:NEXT
```

RESULTS

50 STICKS COMPETITION

HAVING RECEIVED hundreds of entries to the August competition we had a most interesting and often amusing read that took us well into the night.

Certainly, if a joystick could be implanted into one's brain, the majority of *Your Computer* readers would at last be happy. The most surprising thing was how few females entered the competition — come on now girls, you were only noted by your absence. We find it hard to believe that only a mere handful of females read *Your Computer*!

The eventual 50 winners of The Stick cover a noticeably wide age range and the elaborate imaginative illustrations of the younger entrants — about eight and nine year olds — foretell dynamic things for the future. Some harrassed fathers needed a joystick to control their wilder offspring, some entrants seem to be budding brain surgeons with implants threateningly popular, some were constructive well thought out joystick ideas and some were concerned with aiding the disabled.

The Stick, being extremely responsive and for single handed use, working on an eight point mercury switch, will — we know — fulfill all your joystick needs — until of course one of those eight year olds with aspirations to brain survery come of age. And then....?

Among the more off-beat suggestions were D. Bourn's thought-controlled food dispenser and A. Burns' speech activated joystick which moves objects faster when it detects stress in your voice. Best of all, perhaps, was H. McMillan's Jeeves Mk 1 Computer Control System — the accompanying cartoon shows Jeeves running for the keyboard while Bertie Wooster is shouting from the comfort of his armchair: "Dammit Jeeves, Fire!".

WINNERS

B. Mawson, Slough
K. Scott, Jedburgh
R. Scaife, Newcastle
D. Bourne, Wolverhampton
J. Powell, Telford
C. Noad, Yateley
R. P. Shaw, Nailsea
P. Jordan, Pontefract
H. Reeve, Wetherby
B. Woods, Liverpool 12
A. R. Newby, Harrogate
F. Mathieson, Pairley
C. Bloxham, Stratford upon Avon
A. Craig, Heaton Mersey
A. Oxley, Cleveland
S. James, Liversedge
J. Astbury, Clent
A. Adamson, Romsey
H. McMillan, Tollcross
S. Keyworth, Gedling
A. Philmore, Leeds
R. Devlin, Belfast
T. Roche, Poole
M. Cameron, Cowplain
M. Blackburn, Carterton
A. Burns, Penryn
A. Standen, Leonards-on-sea
de Geweidge, Amsterdam
A. Riley, East Moseley
P. Boyde, Northwich
L. Wood, Peterborough
J. Williams, Stoke on Trent
C. Sawyer, Exeter
S. Russell, Glasgow
C. Dorr, Cork
A. Sawney, London W12
M. van Slagesen, Amsterdam
A. Hughes, Wembourne
C. Gallast, BFPO 42
J. Avern, Guildford
D. Perryman, Faversham
M. Sheppard, Brackley
B. Coates, Sth Queensferry
O. Adekunle, Chirnside
K. Lee, RAF Bishops Court
J. Laus, Nottingham
W. Owen, Manchester 23
J. Lambshead, Rainham
A. Hooper, Hauxton
D. Woods, Liverpool I3


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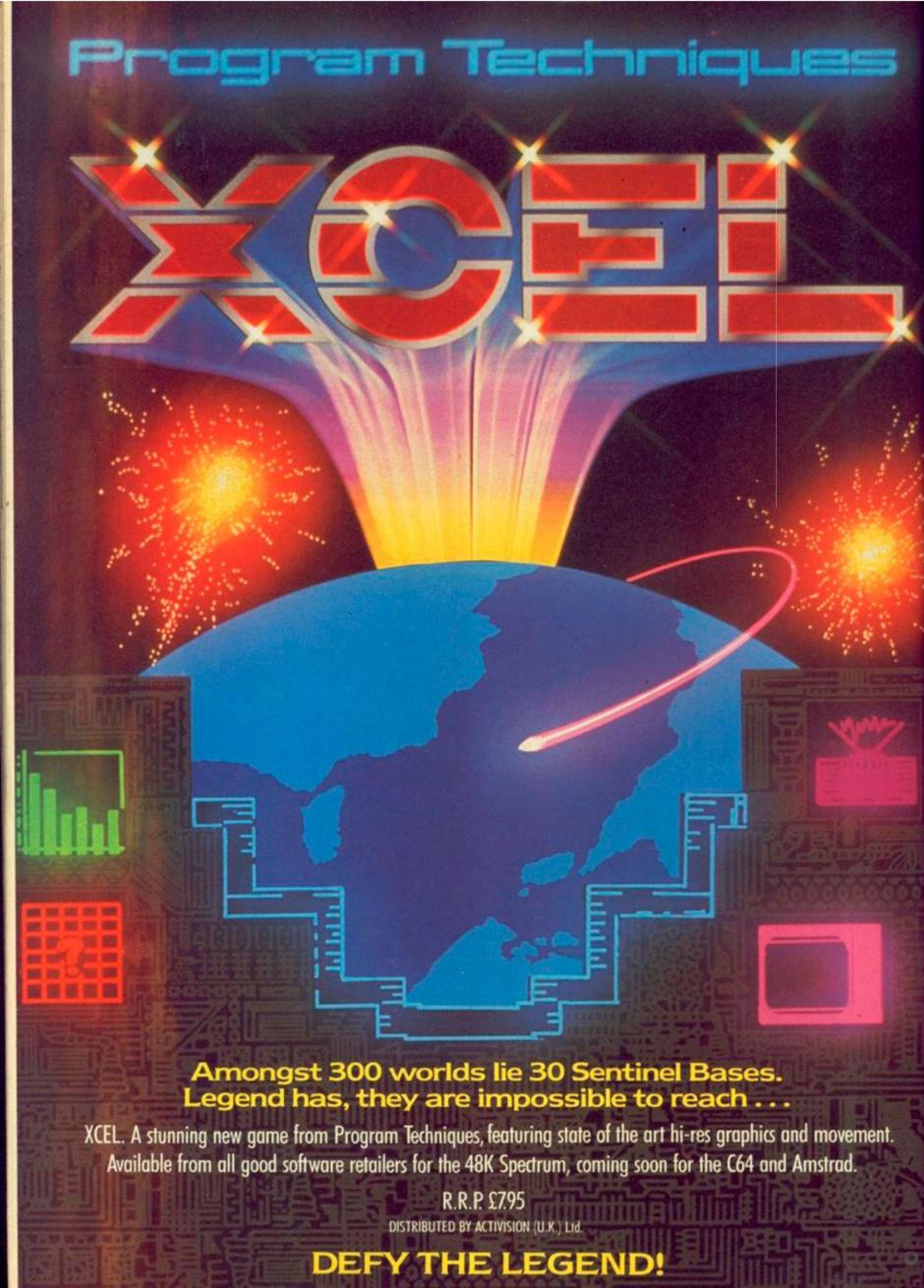
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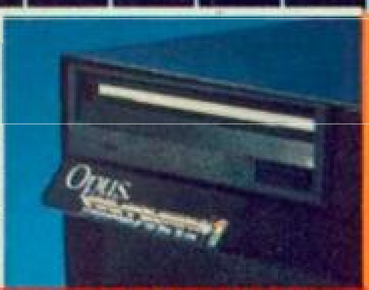
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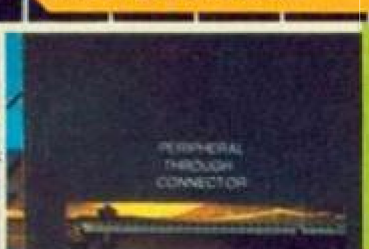
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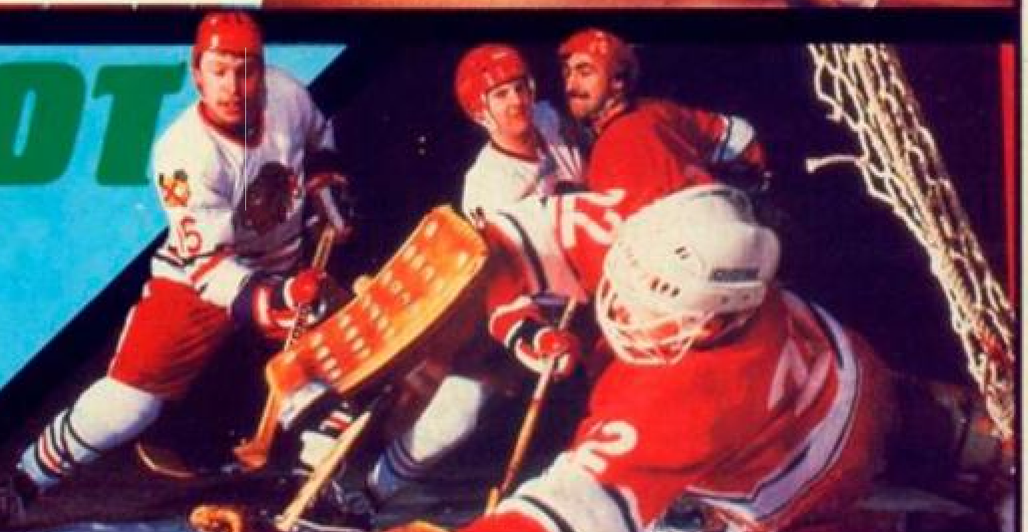




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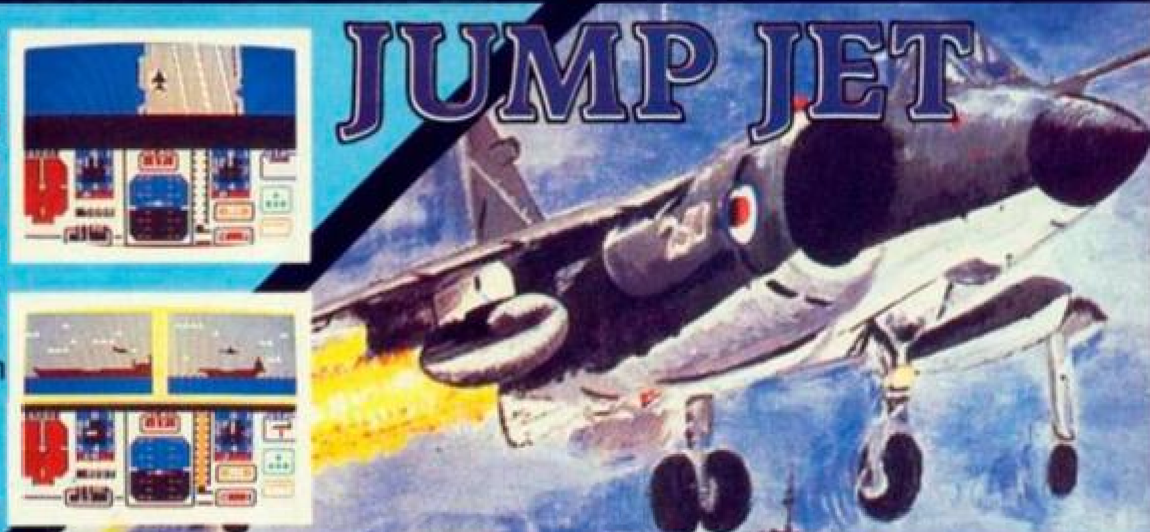
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